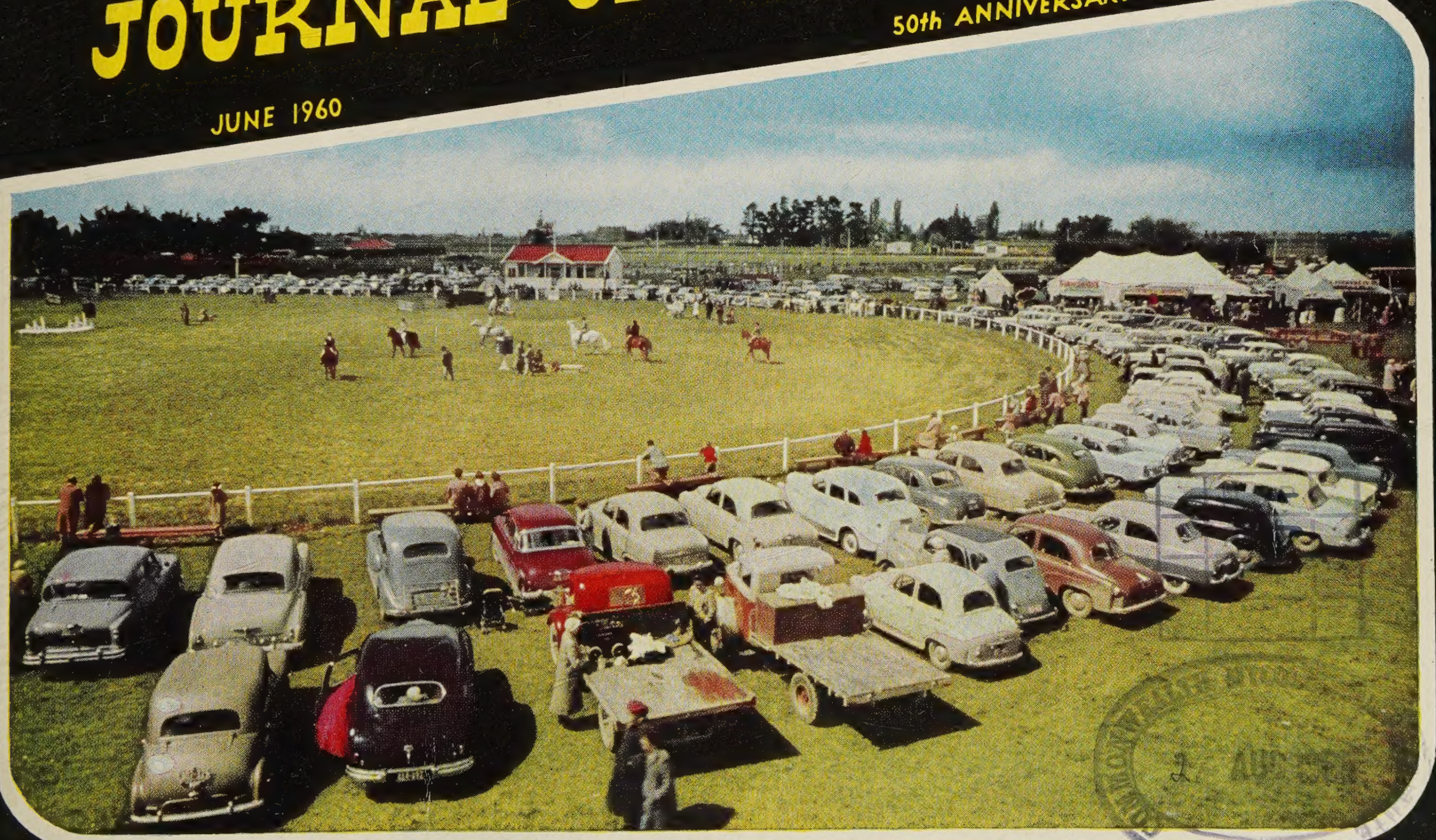
NEW ZEALAND

JOURNAL OF AGRICULTURE

50th ANNIVERSARY ISSUE

JUNE 1960



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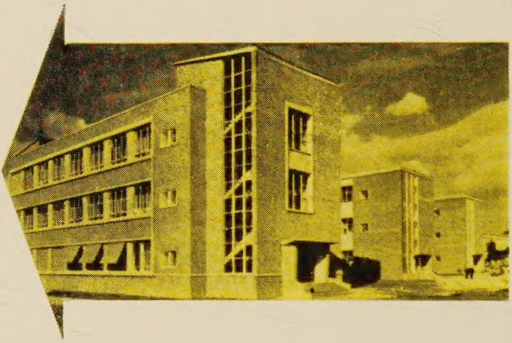

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NEW ZEALAND

Journal of Agriculture

Vol. 100 No. 6 15 June 1960

Editor: G. J. Neale

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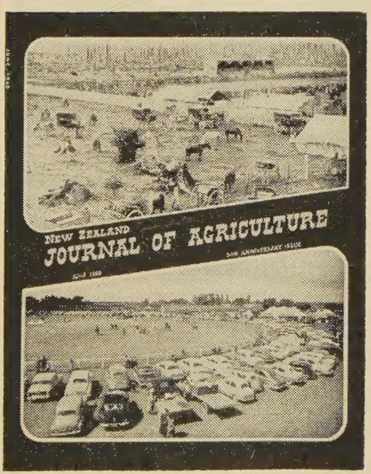


In its setting of burnt-over bush, tree stumps, and pioneer vehicles, the Carterton Showground of the 1890s, as reproduced in the upper panel of our cover from a Turnbull Library print, typifies the lusty agricultural development of the pre-"Journal" era described by P. R. Stephens in this issue.

The contrast in the lower panel of a present-day agricultural and pastoral show in the setting of a developed countryside was photographed by Mannering and Donaldson at the Ellesmere A. & P. Association's show at Leeston last October. The large marquee in right background houses the Department of Agriculture's travelling show exhibit, which has complemented the "Journal" and extension officers in carrying to primary producers the advice and recommendations resulting from the Department's research and experimental work.

Published by Direction of Hon. C. F. Skinner, Minister of Agriculture

1910 OVERTURE

FARMING 50 YEARS AGO

"THE JOURNAL" did not make its entry on the agricultural stage in 1910 to a hushed and expectant audience awaiting a new farming era. It obtruded at mid-scene into a somewhat disorderly drama of lusty growth in a still young country. The background against which it took up its role—a background of change and impending change—is sketched by P. R. Stephens in the following pages.

Heading photograph: Inglewood about 1910.

IN 1910, after the first 70 years of European settlement of New Zealand, the most that could be said, perhaps, was that the shakedown stages of development of the country as primarily an agricultural and pastoral one had passed; the tumultuous and sometimes unsettled periods of the pioneer era had been weathered; and 30 years of refrigeration had already outlined the present pattern of land use and production.

Almost as much land had been occupied for farming as is occupied today, but extension of the frontiers of grass had outstripped the capacity of internal transport and communication services to serve settlement adequately. Isolation and inconvenience were still hindrances to farm life and development in many areas.

The 40,000,000 acres then under occupation (about 24,000,000 acres under grass and 1,750,000 acres under crops) supported 24,000,000 sheep and 2,000,000 cattle. More intensive land use today has enabled 31,000,000 acres under grass and 1,000,000 acres under crops to carry 47,000,000 sheep and nearly 6,000,000 cattle.

In the development of the science and practice of farming the "Journal" has been an important source of information to farmers on advances in our knowledge of soil management, crop and pasture production, and animal management.

Land and Livestock

In recording the history of farming it is difficult and often misleading to lay stress on particular dates. New techniques evolve slowly and it may be many years before they make themselves fully felt.

In 1910 the frozen meat trade was well established, being nearly 30 years old, but at that time the most impressive development was the rapid growth of the dairy industry. In the nine years from 1901 to 1910 sheep numbers grew steadily—from 20,233,000 to 23,996,000—but dairy cows increased from 272,000 to 633,000. The greater part of the increase in both sheep and dairy cows was in the North Island, farming in the South Island being fairly static.

It was apparent that progress in agriculture was bound up with specialisation in dairying and in fat lamb production, but it was still far from clear that specialisation would be based on an almost exclusive reliance on pastures. Yet both scientists and farmers were working toward this goal, though scientists had the most limited resources and farmers had little in the way of expert advice.

The total area under occupation was not so very different from what it is today, as the last large remaining tract of bush country in the Western Uplands was being taken up rapidly, more especially after the completion of the Main Trunk railway in 1908. In the South Island there had been little change in the area occupied since the 1870s and the railway system, too, had been largely completed by the 1880s. The following table shows, in the expansion of the area occupied, the progress of settlement:

	Area occupied acres
1891	31,867,000
1901	34,912,000
1911	40,238,000

Pastures

Land was being established in grass at the rate of about 250,000 acres a year in the first decade of this century, but the pastures themselves were of a very mixed type and no one was more conscious of their inadequacies than the farmers themselves.

On the limited area of really first-class land in the North Island the pastures were fair enough and some of them had a reasonable degree of permanence. Perennial ryegrass (or what was considered perennial ryegrass) was the basis, but there was a fair proportion of cocksfoot which, with the inadequate numbers of stock in spring and early summer, was not properly controlled.

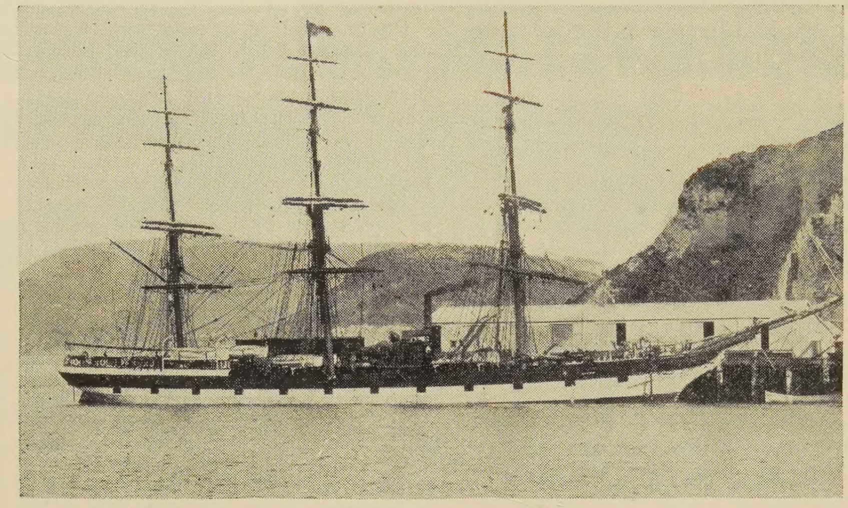
Over much of the ploughable country in the North Island and all the hill country the situation was less satisfactory and by 1910 was causing a good deal of concern. The easier country had all been ploughed at some stage, a crop of turnips taken off, and then perhaps sown down in grass, usually perennial ryegrass. Such a pasture might be reasonably good for a few years, but after that speedily degenerated, being replaced by poor species and weeds.

In some areas an attempt was made to establish a crop rotation system similar to that practised in the South Island, but such methods were not conspicuously successful, and by the beginning of the century it was clear to most people of discernment that the solution lay in the establishment of higher producing pastures.

On the hill country, which had had little more done to it than clearing off of the bush, the difficulties confronting the farmer in maintaining a reasonable pasture cover were even greater, as the initial fertility, rising largely from the ashes of the burnt bush, was fairly short lived, and this, combined with the poor seed that was often sown on bush burn country, often led to a rapid reversion to second growth, bracken fern, and invasion by blackberry. Some farmers were placing greater reliance on the lower fertility demanding grasses.

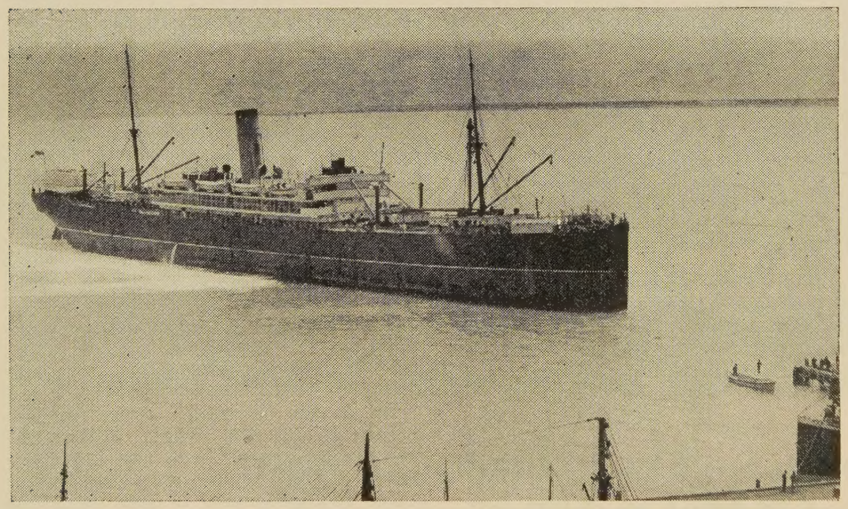
In arable farming areas in the South Island the whole system of farm management was based on pastures being down no longer than three to four years. If they were left longer than that, the better species would largely disappear.

The crop rotation system followed traditional English models, and though it may have provided only limited scope for the expansion of production, it was at least well understood. On the lighter lands and the large area of downlands in Canterbury, Otago, and Southland, which had all been under the plough at some stage, the pastures had reverted to browntop, with here and there a crop of oats or an area in turnips.



The first experimental frozen cargo of meat was taken to Britain in 1882 by the sailing ship Dunedin. . .

. . . Thirty years later refrigerated cargo was being transported in steamers such as the Rimutaka, shown below. Transit time and freight rates had both been reduced.



The total area in annual crops was about 1,750,000 acres, of which wheat comprised in 1910 some 320,000, oats for threshing and chaff 300,000, other cereals nearly 60,000, rape and turnips 660,000, and other fodder crops 310,000 acres (mainly oats). New Zealand was at the time self-sufficient in wheat and in some seasons there might be several hundred thousand bushels for export.

An indication of the state of the pastures was the area saved for hay (silage was relatively unimportant), about 60,000 acres in 1910. Departmental reports often drew attention to the inadequate supplies of winter feed on North Island dairy farms. The tendency of farmers to cut particular areas for hay every three years or so did not help to maintain fertility. Small farmers, and particularly dairy farmers, found haymaking took a lot of time, as they did not have much in the way of equipment such as mowers and rakes.

Exports

New Zealand in 1910 depended almost entirely on the United Kingdom market, and as this appeared able to absorb all that could be produced, no particular concern was felt about overseas market trends.

Some 84 per cent of the country's exports went to the United Kingdom and 9 per cent to Australia, the role of other markets in the country's economic life being very insignificant. Some 62 per cent of the imports came from the United Kingdom.

Principal Exports in 1910

IN 1910 the quantities and values of New Zealand's principal exports were:

Wool	
Quantity	204,400,000 lb
Value	£8,308,000
Frozen Meat	
Quantity	132,700 tons
Value	£3,851,000
Butter	
Quantity	17,800 tons
Value	£1,812,000
Cheese	
Quantity	22,600 tons
Value	£1,195,000
Grain	
Quantity	1,980,000 bushels
Value	£318,000
Tallow	
Quantity	26,000 tons
Value	£757,000
Meat By-products	
Quantity	—
Value	£1,050,000

Agricultural protection was strongly entrenched in most European countries before 1914 and a combination of high tariffs and harassing regulations effectively excluded most New Zealand meat and dairy produce. For example, in France since the 1890s frozen meat could be admitted only if the internal organs of the animal were still in position.

Marketing procedures in 1910 followed accepted patterns, and though at times dissatisfaction was expressed at the fluctuations in overseas prices, the right of merchants to buy and sell in their own interests was hardly questioned. The one exception was frozen meat, and numerous discussions took place on how the trade could be improved to the advantage of the producer. It was often asserted that shipping lines were exploiting the producer and fears were also being expressed about the activities of the Chicago meat trust.

Tussock Grassland

The 18,000,000 acres of tussock grassland in the South Island were very largely occupied in the late 1850s, following closely the occupation of the easier country.

Within a few years a well defined management pattern was established.

On the ploughable country tussocks had generally given way to exotic grasses by the late 1870s, a system of arable farming being established on the better-class country and on the poorer land a crop of turnips or oats was usually taken off when the land was first broken up.

The high country stretching from Marlborough to west Otago was occupied in large blocks, and it was soon found that the carrying capacity of a run was determined by the area of winter country available.

The other feature of management was regular burning, though even in the earliest stages this practice had some critics.

There was also a fairly general tendency to overstock the high country runs, though the dangers of this practice were brought home sharply to runholders in the winters of 1895 and 1903.

By the end of the century there was also an awareness of the fact that on some of the tussock country the carrying capacity was declining, and in parts of Central Otago deterioration was rapid.

1905 Commission on Land Tenure

In 1905 the Commission on Land Tenure, which was intended to provide authoritative guidance on the vexed question of freehold versus leasehold but which succeeded only in repeating the current controversies on the subject, commented on the South Island pastoral leases:

> Under this tenure there are about twelve million acres of mountainous country of an altitude above sea level varying from 1,000 ft to 5,000 ft ending in barrenness and snowfields. It is mostly open country supporting indigenous grasses which have deteriorated greatly through indiscriminate burnings, rabbit pest, and overstocking. The question of restoring these mountain pastures is very important, as they are the natural breeding-ground of the Merino and hardy crossbred sheep, from which the settlers on the lower country largely draw their supply of ewes for replenishing their flocks. [It can be assumed that the Commission really meant half-bred sheep rather than crossbred.]

Some five years later, in 1910, another Commission of three was appointed to report on the subdivision of the high country runs in Canterbury. It also failed to attain unanimity, two members favouring a degree of subdivision but the third considering that the process should be carried much further.

The Commission gave some attention to the problem of depletion, one of the observations made being: "In travelling over the Mackenzie Plains one is impressed with a weary feeling of sadness and regret at the large extent of country which is almost depleted of all vegetation, save sorrel and 'scab-weed.' "

In describing the principles adopted in redrawing the boundaries of runs the majority report declared: "Unless it could be shown that holders of small blocks would be certain to retain Merinos, and continue to breed either Merino or first-cross sheep on the lines of the present flocks, we fear that transition from large stations to the small runs would be detrimental to the sheep flocks of Canterbury as a whole."

Witnesses who appeared before the 1905 Commission made many suggestions to combat deterioration, most of them emphasising the need for greater security of tenure, but also the need for spelling large areas, better subdivision, and, of course, reduction in the number of rabbits.

One of the Department's Stock Inspectors, J. L. Bruce, said at a conference of agricultural and pastoral societies in 1909: "The first time I came in touch with the thing [deterioration] I thought that our native grasses were really gone and gone for

By 1910 the decline in the carrying capacity of much of the South Island tussock country was causing concern.

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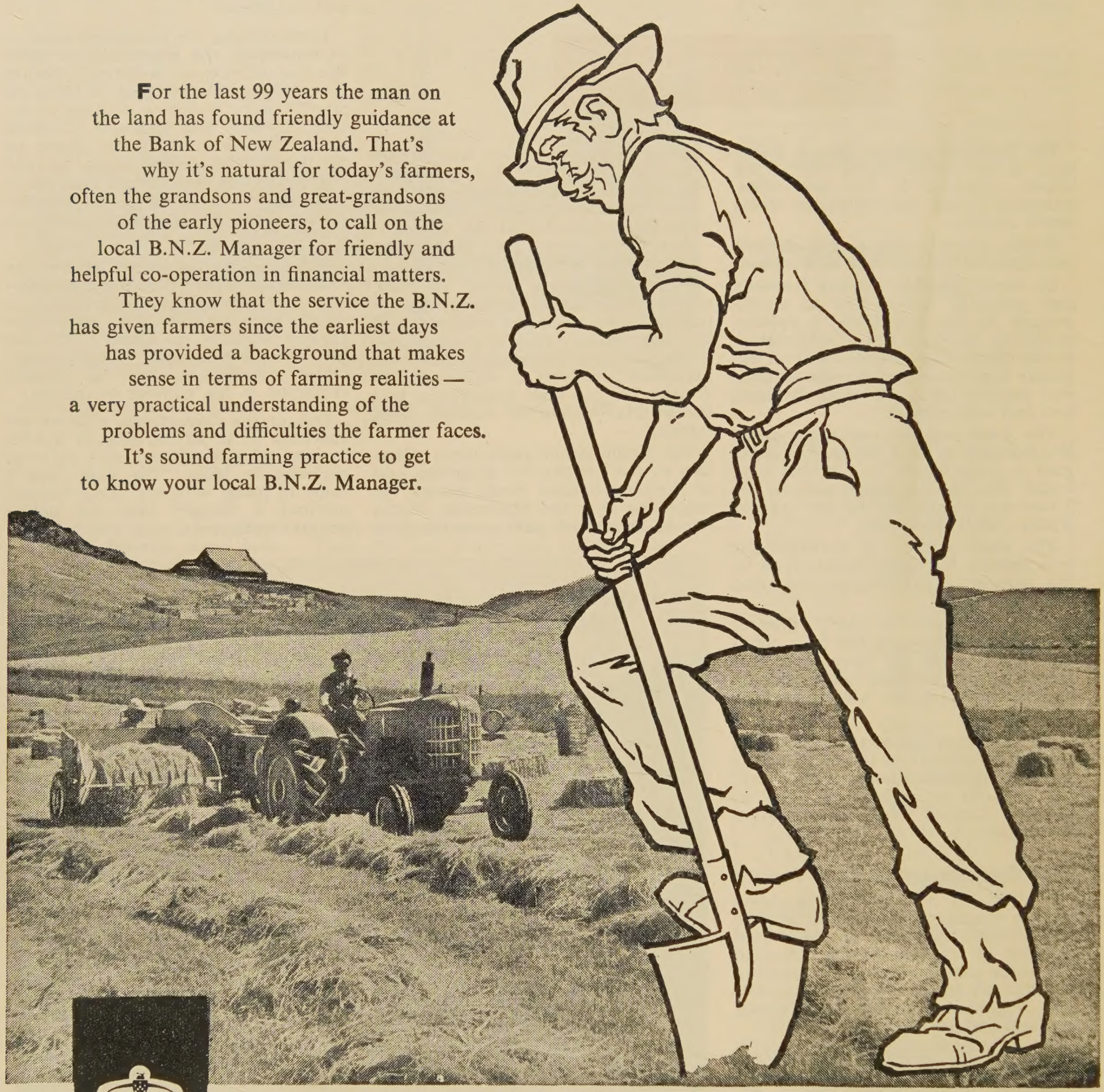

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ever. Later, where the rabbit pests ceased, I noticed that the native grasses were still there and to me it was the first sign of hope for this country."

Effects of Overburning

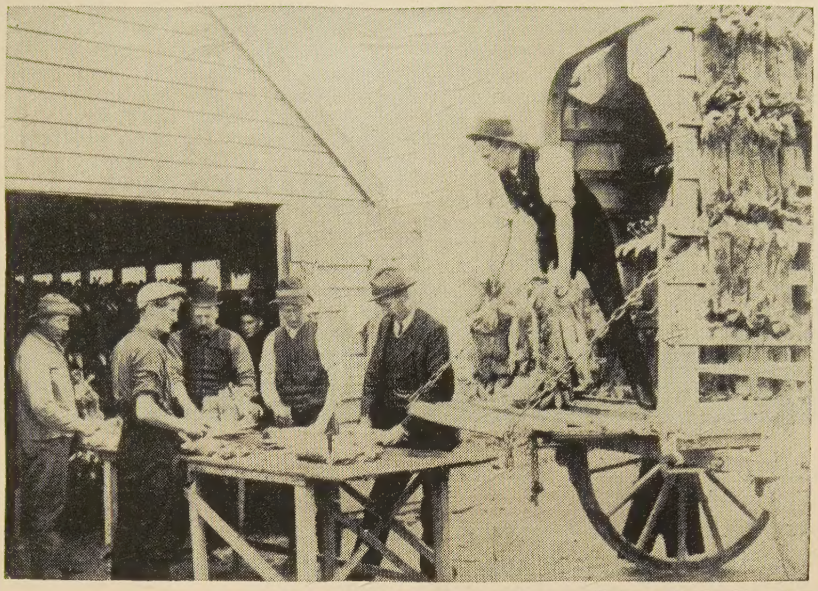
Some distinction has to be drawn between conditions in the high country areas, where the rainfall was heavier, and those in the low rainfall areas of Central Otago, where the rabbit was the principal agent of destruction. The first authoritative report on the state which this latter country had reached was issued in 1912 with the publication of a Departmental bulletin by Donald Petrie, "Report on the Grass-denuded Lands of Central Otago."

Petrie made reference to the fact that the effects of overburning were already being observed by 1865. He was pessimistic about the ability of the more seriously depleted country ever to recover, remarking at the conclusion of his report: "Under present conditions of stocking by sheep and rabbits, the grasses of the tussock steppe are very unlikely to reoccupy the desert ground."

He added:

> The conservation and improvement of the pastures that are undergoing deterioration—and very extensive areas (four or five million acres probably) are in this position—is a question of even greater importance and urgency than is the reclamation of the desert lands. For this purpose grass burning should be stopped on all arid lands. Runholders will probably be willing to abandon the practice, if any are foolish enough to continue it in such circumstances. Rabbits must be strongly kept down and the stocking of sheep be reduced to a point that will allow the grass in the drier lowland areas to seed and have a chance of increasing. Self-interest should prompt runholders to take these steps of their own accord. Best of all would be the resting of the pastures for three or four years, the rabbits being, of course, kept down—but this tenants cannot be expected to do.
>
> Under existing leases it may be impossible to enforce remedial measures, but unless the pastures are to go from bad to worse this must be changed. . . . In all future leases of pastoral country the maximum stocking of each run should be fixed by the terms of the lease and provision should be made for reducing the stocking at any time should that be deemed necessary, the rent being reduced in proportion. These provisions are indispensable if deterioration is to be avoided for the future. Had they

The Rabbit Menace in 1910



["*Otago Daily Times*"

RABBITS were a threat, real or latent, over much of New Zealand in 1910 and were not confined to the denuded tussock country, though only in certain areas was there danger of their obtaining a firm hold.

In Central Otago they had been present since the early 1870s and in the next decade or so they looked as if they would take complete possession.

By 1910 a certain degree of balance had been attained and many reports by Stock Inspectors claimed that infestation was less serious than it had been 10 or 20 years before.

The effects of rabbits, as Donald Petrie pointed out in his bulletin in 1912, could easily be worked out by examining the sheep returns for Vincent County, which in 1879 ran 460,000 sheep and in 1910 304,000.

Galloway Station, a property of 129,000 acres, carried 75,000 sheep in 1879; by 1910 practically the same area was carrying only 27,000.

Departmental reports pointed out on many occasions that as long as the rabbit was commercialised there was little chance that any control measures would be really effective. As the Secretary for Agriculture remarked in his annual report for 1910: "The high price of skins as well as of the carcasses precludes hope of any steps being taken towards extermination in districts where the rabbit is regarded as an object of industry." The total number exported in 1910 was 9,104,000, valued at £133,000.

Trapping and phosphorus poisoning were the main methods of control, and a good deal of faith was still placed in ferrets and weasels, though their ineffectiveness had been shown clearly enough.

been in force for the last 20 years, the depletion we have to deplore, and remedy if we can, would never have arisen.

Most of Petrie's recommended remedies, though drastic, have been adopted and are in operation today.

Decline of Merino Ram Numbers

Between 1900 and 1910 the number of Merino rams in the South Island declined slightly, and this obviously caused a good deal of concern. Strangely enough Merinos in the same period increased in the North Island, though this was probably an attempt to breed a half-bred ewe as a fat lamb mother on the Canterbury model. After 1910 Merinos in the North Island declined rapidly.

The main reason for the slight fall in the South Island was the subdivision of many larger estates. These properties in the easier country were the source of the Merino and half-bred ewes, which were the basis of the Canterbury fat lamb industry, as the number of surplus ewes from high country properties would be strictly limited.

Another factor which could have been an influence was the margin between the price for fine wools and that for the coarser types. When the margin narrowed farmers tended to give less emphasis to fine wools.

Surface-sown Grassland

Concern was being expressed publicly about the deterioration of the tussock grasslands, and in the Department's annual reports for the years before 1910 a number of references were made to the difficulties of maintaining good pastures on the surface-sown hill country. The following table shows the increase in the area of surface-sown grasslands between 1901 and 1911 (no figures are available for 1910).

	North Island	South Island	Total acres
1901 ..	5,432,000	1,224,000	6,656,000
1906 ..	6,281,000	1,465,000	7,746,000
1911 ..	7,441,000	1,774,000	9,215,000

In 1910 the bush burn era was coming to an end. In the North Island the process began seriously in the 1870s and by the time the Main Trunk railway was completed in 1908 the only large area of bush country left was in the King Country, and clearing of the bush there was in full swing.

During the 40 years 1870 to 1910 about 10,000,000 acres were cleared, comprising most of the North Island hill country, though in Taranaki, Rangitikei, the Manawatu, and southern Hawke's Bay, for example, much of the bush was on better-quality land.

Seedbed from Good Burn

In the "Journal" for November 1913 A. H. Cockayne in an article "The Surface-sown Grass Lands of New Zealand" said:

> After a successful burn the resulting conditions very closely approximate to those obtaining on ground that has been ploughed and cultivated in such a manner as to produce an ordinary seedbed. That this statement is essentially correct can be gauged by the fact that after a "good burn" an excellent crop of turnips, provided the season is favourable, can be grown without any manipulation other than scattering the seed on the surface. It is, indeed, difficult for anyone unacquainted with bush conditions to understand how it could be possible to grow a successful turnip crop on land that has never been cultivated in any way. Yet in very many cases turnips and allied seeds are always included in the grass mixtures to secure a fattening-crop within a few weeks after the seed has been sown.

Taxes 50 Years Ago

Income Tax

6d. in the pound on incomes of £300, rising to 1s. 2d. in the pound on incomes of £2,300.

Land Tax

1d. in the pound on the unimproved value.

Graduated Land Tax

1/16d. on estates with an unimproved value of £5,000, rising to 2 per cent on estates with an unimproved value of £200,000.

Total Government expenditure in 1910-11 — £10,729,000.

Vote Department of Agriculture and Commerce for 1910-11—£160,405.

When cocksfoot was the main constituent of permanent pasture cocksfoot production was of considerable importance on Banks Peninsula. The hilly nature of the country made cutting by sickle or scythe and threshing by flail necessary, though by 1910 small portable threshing plants were also used.

The Bush Burn Technique

THE bush burn technique, by which about 10,000,000 acres of land was cleared in New Zealand between 1870 and 1910, was known to the Maoris, but the pioneer settlers also brought the idea from Australia and Canada. The usual practice was to begin to cut the undergrowth and the smaller trees (those with a diameter of less than 18 in.) about June and leave the larger trees. In February or March the whole mass would be set alight. If the weather was dry and there was a favourable wind on the day of the burn, the fire would sweep through everything, leaving only the trunks of the large trees standing, but with a tangled mass of logs on the ground.

Much of this work was done by individual settlers who took up bush sections under the system of deferred payments and who helped to finance development by contract work for the Public Works Department or the county council.

The establishment of a system of Advances to Settlers in 1894 was a great boon to such men, who had until then struggled on without adequate capital. There were always a good many casualties among such settlers and many of those who succeeded did so because the construction of roads or railways brought about a considerable appreciation in the value of their properties. The men with more capital could have the bush cleared on contract, the rates during the 1880s and 1890s, when labour was plentiful, being from 30s. to £2 an acre, and even by 1910 these rates would not have been much higher.

If the burn was more or less successful, the next task would be to scatter grass seed in the ashes while some of the logs might still be smoking and arrange to buy by the following spring a line of ewes that suited the particular class of country. Another task would be to fence the whole property. If the burn was not successful (and often the weather was unfavourable), the whole process would have to be postponed for a year.

Cause for congratulation –

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Thus the conditions at the time of sowing, provided the "burn" and the weather are favourable, are excellent for the germination of seeds, and immediate covering of the ground with a plant population is dependent entirely on the quantity and quality of the seed used. . . .

After the grass mixture has been sown a thick covering of grasses and clovers should become immediately established provided conditions are in any degree favourable. After the first season, however, a great deal of replacement occurs. The whole object of successful management of "bush burns" is to direct this replacement and arrangement of the vegetation into those channels which will result in a thick, uniform turf consisting of those grasses and clovers that are valuable for grazing and will hold complete possession of the land for an indefinite period. In many cases, however—and this is particularly true of areas where errors in management or unfavourable circumstances have arisen—replacement in a direction antagonistic to the interests of the farmer takes place.

Little attention was paid to housing by a settler in his first years on a block of bush country . . .

. . . but a few years later he would aim higher and begin the building of a simple four-roomed house.

It is not too much to say that a great deal of the trouble that has arisen through harmful replacement in bush pastures is due in the first place to faulty seeding. Too much stress cannot be laid on the fact that it is only at the one period following burning that the conditions are suitable for the germination of grass and clover seeds. . . . No matter how careful is the after-management of the pasture, the harmful effects of inferior seeding, by increasing the chances of replacement in objectionable directions, are almost certain to arise. Even in cases where the seeding has been a good one, natural replacement by such vegetation as fern or manuka is often likely to take place unless the most careful management be adopted. It may be thought that any danger of replacement by harmful vegetation could be avoided by using a properly balanced mixture. It is, however, extremely difficult to decide what constitutes such a mixture, as, with the exception of ryegrass country, the composition of the mixture and that of the final pasture is in the vast majority of cases very different. In many cases the dominant grass of the pasture may not be by any means the dominant one that has been used in the mixture. The period during which the more temporary grasses that have been used are running out constitutes the time when replacement by harmful vegetation is most likely to occur. Of course, where conditions after sowing have been unfavourable a more or less complete failure of the sown grasses may occur, and under such circumstances the country may rapidly and completely revert to native vegetation. In general, however, for some years after sowing the yield of herbage is often very great, but on poor soils this is often seriously diminished after a few years, especially where the majority of the seed used has been ryegrass, the duration of which under such conditions is of quite a temporary nature.

One of the greatest factors in controlling and suppressing replacement in harmful directions is by judicious stocking. In fact the proper employment of stock and the

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In newly opened up bush country cattle were needed to keep second growth in check. This large mob is shown crossing the Patea River about 1910.

use of high-grade seed represent the two cardinal factors that determine the future utility of surface-sown pastures. . . .

It has been quite a common custom to consider that any class of seed is good enough for bush burns. The fallacy of this is clear when one considers that the greater portion of such country is intended to remain in grass for all time. Again, in very many cases the configuration of such country precludes the possibility of cultivation ever being carried out, and the only chance to introduce with success those plants that are desired is at the time of the first sowing. Errors in seeding and management on cultivated land are comparatively easy to remedy, but when applied to surface-sown land that can never be profitably ploughed their effects must remain a permanent incubus upon the future utility of the pasture.

A writer in the "New Zealand Farmer" for March 1910 giving advice to those [in Auckland] taking up bush burn country suggested that a seed mixture of 30 lb to the acre would cost 10s. to 12s. The sowing would cost 1s. to 1s. 6d. per acre. If the burn had been early—in January—and turnips were sown with the grass seed, store sheep could be brought in about May and the writer recommended dry sheep rather than breeding ewes, as the former could be shifted at any time.

The first task after the sowing was to construct boundary fences, using if possible puriri posts and, if these were not available, totara. A seven-wire fence, if posts did not have to be bought, was estimated to cost £65 per mile in 1910. The article concludes by declaring: "If the country is first class, it will winter two sheep to the acre and a cattle beast to ten acres as well, and it will carry twice the number of stock in the spring and summer."

Disposal of Logs and Stumps

The success of a burn was measured largely in the number of logs and stumps left lying about. Disposing of the logs and stumps might occupy a farmer a good many years. Logs were not so difficult to handle, but getting rid of stumps was a slow and awkward job. On the hill country it might not be attempted at all, but on the ploughable country it was essential. The better-quality land was also in heavier bush, which made the task all the more difficult.

The Department's farm at Weraroa is a good example of this type of property. The country round Levin was all in heavy bush which was cleared in the 80s and 90s after the completion of the Manawatu railway. When the Department of Agriculture took over the Weraroa property from the Department of Labour in 1899 it was ring fenced, but most of it was strewn with logs and stumps. Over the next 10 years these were gradually removed, the work being done on contract at £4 per acre. This was a higher figure than most farmers would have paid.

Cockayne's article illustrates clearly the danger of bush burn country reverting to weeds and second growth if insufficient care was given to the establishment of a reasonable pasture cover. In the decade before 1910 this problem was exercising the minds of many farmers and associated with it was the apparent inability of the better pasture species to survive. It was also apparent about the same time that the lower fertility demanding grasses were showing more resilience and under some conditions would prove much more satisfactory.

In his annual report for 1901 Edmund Clifton, Chief Inspector of Stock for the Auckland district, wrote:

> Nature herself is effecting a beneficent transformation over the face of the country, with the assistance of her own natural allies—the indigenous grasses of New Zealand. From North Cape to East Cape, along the West Coast, and through the Waikato, these grasses—Danthonia (several varieties), Microlena, and Chewing's fescue (this last may almost be admitted as a New Zealand grass)—are everywhere increasing. These native grasses have taken advantage of the careful preparation made by our settlers for the reception of exotic grasses—rye, cocksfoot, clovers, etc. These natives unostentatiously, and by the settler unwelcomed, replaced those earlier, costly, and but fleeting guests, designated under the generic name of English grasses.

Clifton added:

> The danthonia has become the most prominent grass in the north of Auckland, except in a few favoured places where the imported grasses thrive.

Eight years later, in 1909, Clifton, addressing a conference of agricultural and pastoral societies, described how he had seen farmers in Northland ploughing up naturally established danthonia, but finding it was impossible to establish anything else.

In fact there was a keen demand for danthonia seed about that time and some farmers were finding the sale of it very profitable.

Ploughed Grassland

The total area of ploughed grassland in 1910 was about 5,000,000 acres. There was also about 2,000,000 acres in annual crops which would be in grass at some stage of the rotation.

Some years after 1910 A. H. Cockayne, in an article in the "Journal" on the grasslands of New Zealand, described the principal features of New Zealand pastures. With regard to permanent grassland he wrote:

> Permanent pasture is generally the type aimed at on heavy soils of rather a moist character, and on good swamp soils that have been drained and rendered suitable for cultivation. In places perennial ryegrass is the main grass used, as, for example, on the land around Hastings and on the river-bottoms of many of the North Island east coast rivers. Permanent pasture, however, generally consists largely of cocksfoot, and on specially favoured soils meadow foxtail may be the chief grass used. High-class permanent pasture on ploughed land often becomes invaded with serious weeds or succession growth. In general, the most serious succession development that takes place is to rushes, but proper attention to drainage should generally act as an efficient control in this respect. In fact, in nearly every case the weed that becomes dominant is one that does not tolerate well drained conditions. Buttercups, self-heal, certain docks, and pennyroyal are good examples of this.
>
> Permanent pastures on ploughed land are nearly always used for dairying and may often be cut for hay. The weakness of much of our permanent pasture of this type is its paucity of clovers, a defect that does not seem to be remedied by an increase in the clover content of the seeding.

Short-rotation Grassland

In his description of short-rotation grassland Cockayne drew attention to the problem of undesirable succession which appeared after the third year and which created the most serious problem of pasture management in the North Island.

He said:

> Short-rotation grassland is important in New Zealand, not less than 500,000 acres being laid down annually. The duration varies from three to five years, but generally by the end of the third season an undesirable succession has taken place, necessitating ploughing up. It is on these short-rotation pastures that most of the perennial ryegrass is used, and they are all of a ryegrass type. Short-rotation pasture is found chiefly in the cereal-growing districts of the South Island. In the drier parts from 25 lb to 30 lb of seed, including a bushel of ryegrass, is sown, and in the wetter parts from 40 lb to 50 lb of seed is used, including about a bushel and a half of ryegrass. . . .
>
> White clover is often omitted, as it is said to come up naturally. In Canterbury very little except perennial ryegrass, cocksfoot, and red clover is ever sown, but in Otago and Southland more elaborate mixtures are often used. . . .
>
> One of the great faults of the short-rotation pastures of the South Island is that they cannot be left down and function as long-rotation ones. In most cases a succession takes place after the third year, and poor grassland results. The commonest types of succession are—
>
> Ryegrass to goose grass—hair grass to *Poa pratensis*—yarrow.
>
> Ryegrass to goose grass—hair grass to Yorkshire fog—agrostis.
>
> Ryegrass to goose grass—hair grass to sweet vernal—danthonia.
>
> Ryegrass to goose grass—hair grass to catsear, sorrel—sweet vernal, etc.
>
> One of the most pressing problems of grassland study in the South Island is the successful grassing with a profitable type of long-rotation mixture in which successions such as the foregoing would not occur.
>
> The greater part of short-rotation grassland is spring-sown either with rape or oats. The fact that the pastures soon become worn out has rendered both a cheap type of seed and a cheap establishment necessary. For the same reason topdressing is not popular, and the opinion that it makes no difference is regularly expressed. Sowing with rape is most popular in the southern districts, but in parts of Canterbury seeding with a cereal crop is still largely carried out. Short-rotation grassland is nearly always of low carrying capacity when once the ryegrass begins to flower, and extensive use of summer supplementary crops is a conspicuous feature over the area where such grassland is the regular type. The winter carrying capacity of short-rotation pasture is also often poor in the South Island, but this is due to climatic conditions, and can never be avoided. In very dry districts short-rotation grasslands often fail completely in the second summer, but even in comparatively wet districts their midsummer yield of palatable herbage is poor. A considerable amount of short-rotation grassland is cut in its first and second season for ryegrass seed.

In the South Island pasture deteriorated after three or four years and on the lighter land it was difficult to establish reasonable pasture at all. Periodically the land therefore had to be ploughed up again. Traction engines were tried as power units in this work on the larger properties, but despite the many attempts made with them, they were never very successful.

Two Major Problems

The general picture that Cockayne painted was not a very satisfactory one, the two major problems being the lack of permanence of much of the ryegrass sown and the difficulty in establishing clovers.

In the arable farming districts of the South Island this lack of permanence in pastures was accepted as being part of the nature of things and a substantial area of a farm would be in annual crops each year. A farmer would have the range of implements, including a team of horses, to undertake this type of farming. Under such a system it was not possible to increase carrying capacity substantially, but the system of management was well understood.

In the North Island conditions were much less settled, as by 1910 the more progressive farmers in the Waikato and in Taranaki were becoming aware of the role that topdressing could play. In the higher-rainfall districts of the North Island the South Island system of arable farming was not a success, and though it was attempted, perhaps more by accident than design farmers came to rely on pasture with a minimum of supplementary crops.

The Department of Agriculture was recommending that on the poorer classes of land lower fertility demanding pasture species than the usual ryegrass-cocksfoot mixture should be sown.

The problem with regard to perennial ryegrass was illustrated by the comments on this species included in a brochure the Department of Agriculture distributed at the Christchurch International Exhibition in 1906:

> Perennial ryegrass . . . A perennial grass common in all good pastures and used more extensively than any other grass. As to its true value, there has been much controversy; nevertheless its rapid growth, good yield, hardiness, and power of mixing well with other grasses on all soils, save the driest, place it in the front rank of grasses. A grass that varies considerably, but unfortunately no systematic attempt is now made to secure seed of varieties that might prove of great value.

Though phosphatic topdressing had begun (probably on some farms as early as the 1890s) it was not generally expected that, except on the best land, rotational pastures could become permanent.

Attention was focused on the best means of securing permanent pastures on the poorer ploughable land where rotational farming was uneconomic because of the low yields of annual crops and the hazards of harvesting cereals in high-rainfall districts.

If the land was not fertile enough for the permanence of white clover and perennial ryegrass, low fertility demanding grasses such as sheep's fescue, danthonia, paspalum, ratstail, *Poa pratensis*, and Indian doub might be better than constant recourse to the plough.

Pasture improvers were working in two directions. On the one hand the Department of Agriculture was sowing down field trials on poor ploughable land with danthonia, sheep's fescue, and other low fertility demanding grasses, and on the other hand it was putting down topdressing trials on better land to demonstrate the efficacy of phosphatic fertilisers in prolonging the life and increasing the production of rotation pastures.

Topdressing Experiments

Experimental work by the Department with topdressing began at Ruakura in 1904, four years after the property had been acquired as an experimental farm. There is reason to believe, however, that some Waikato farmers had been forced by necessity to adopt a form of topdressing as early as the 1890s. A mixture of equal parts of superphosphate, guano, and bonedust became known as the Waikato mixture.

The modified rotational system proved singularly unsuccessful in the Waikato, annual crops such as turnips not being of a high standard and the short-rotation pastures little better. The bonedust used to stimulate turnips must have been applied by some farmers directly on to pastures, even though it would be fairly slow acting. The bonedust from India also brought with it anthrax, which caused sporadic outbreaks for a number of years.

In 1904, at the request of the Waikato Farmers' Club, the Department began a series of topdressing trials at Ruakura. Fertiliser trials with annual crops had been in progress for some years at the Moumahaki experimental farm.

The pasture at Ruakura consisted chiefly of sweet vernal, fog, some trefoil, and a little cocksfoot and creeping bent.

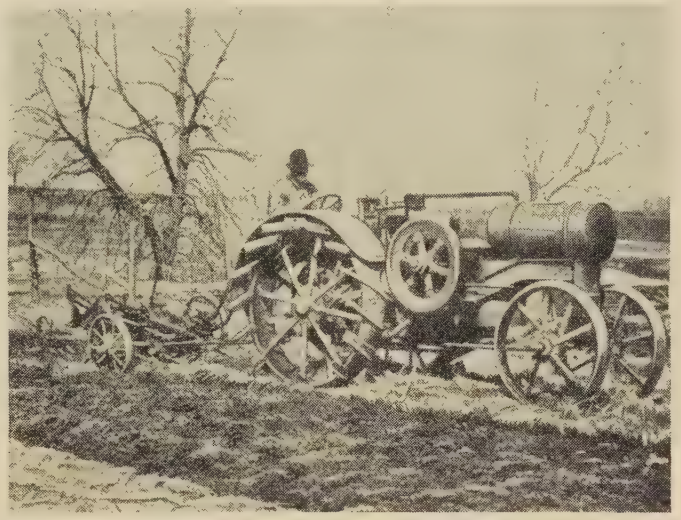
The Department's report for 1905 said:

> One of these old pastures in 1904 was stocked heavily, hay carted on to it and fed off, 2 cwt of basic slag applied, the whole well harrowed,

(Continued on page 603)

1910

The first IH tractor was an 11-ton Mogul with a two-cylinder engine. The illustration below shows a 10 - 20 TITAN TRACTOR made at the Milwaukee Works after 1908.



In 1910 the New Zealand offices of the International Harvester Company of America had already been in existence for a year. The International Harvester Company of New Zealand Ltd., was established with the opening of a depot in Christchurch in 1912. But McCormick equipment had been sold in Canterbury since 1875.

1960

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A Means of "Early and Timely Publicity"

INTRODUCING the first number of "The Journal of Agriculture" in 1910, Thomas Mackenzie, Minister of Agriculture and Commerce, said, "Our country is now well forward in the estimation of the world. Our climate, our fertile soil, and the enterprise of our people have combined to provide the enormous export of agricultural products to the value of £17,435,191 per annum. This may well be accepted as a warrant for the best efforts of this Department in the development of agriculture."

Citing the extent to which all civilised countries fostered and encouraged agriculture, the Minister said its science and practice commanded the earnest thought of all progressive Governments. "The United States of America placed last year the sum of $15,000,000 at the disposal of the Minister of Agriculture. The people of those States realise the overwhelming mandate that their best interests are inseparable from the land."

It is a measure of the progress made in the 50 years of the "Journal's" publication that the figures quoted above seem almost ludicrous. The "enormous export of agricultural products" today earns about £300,000,000 per annum; and allocation of public money in New Zealand to the service of agriculture exceeds considerably the United States Federal expenditure of 50 years ago.

Closest Relations Between Agriculture and State

"In this Dominion," the introductory statement continued, "we depend now, and must depend for many years to come, on the products of the soil. Here is the warrant for the closest of relations between agriculture and the State. . . . New Zealand's competition is in the world's market; it is handicapped in one direction only, and that is the handicap of distance. . . . It is to minimise the disadvantages of distance, and to develop our natural advantages, that the Department is devoting its enterprise and that it is associating itself so intimately with the agricultural community."

In authorising the publication by his Department of a monthly "Journal", the Minister and the Departmental officers who had recommended the venture to him were striking out in a new field. In keeping with the rugged pioneer spirit still evident in the young country, they did so with very limited resources of personnel and equipment but undaunted by the great labours that faced them.

Many Problems for Solution

"In New Zealand," the first "Journal" stated, "there are many problems relating to agriculture to be solved, such as the restoration and conservation of the grasses and edible plants of the pastoral lands of the central regions of the South Island, the development of wide areas of the interior of the North Island, and the utilisation of land situated on the western coast of the South Island. . . . It is the intention of the Department to undertake investigations in the direction of the elucidation of these special conditions."

These were courageous aims for the then small body of workers. Perusal of the files of the period gives little indication that there was a dramatic realisation that a tide in the affairs of men had been reached which had to be taken at the flood. In the light of the tremendous accomplishments in agricultural and pastoral improvement in the 50 years that have passed, one must pay tribute to the men whose foresight anticipated the need for a "means of securing close and immediate relations between the farmer and the Department." There must have been few who appreciated the great lack of basic knowledge and the magnitude of the tasks ahead.

Lack of Basic Scientific Skills

Scientific knowledge of agriculture was very limited and its application even less, and it is unlikely that the Government or the farmers themselves were aware of how short we were of basic scientific skills. There was, however, some realisation that the "frontier of settlement" had almost been reached and that future agricultural expansion could come about only through the more intensive use of land already being farmed.

Resources had seemed boundless and had been used prodigally during the wave of settlement in the 19th century, but when President Theodore Roosevelt forcibly drew attention in the first decade of the 20th century to the need for conservation of land and forest resources, a modest beginning was being made in that direction in New Zealand.

The Government had shown interest in bringing into production land that was beyond the resources of the individual settler to develop economically; large-scale schemes of land drainage were being started; irrigation plans were under way; and a more effective policy for administering State forests was not far off.

Environment Favourable for Expansion

Though the resources that could be marshalled in 1910 to meet the growing needs of the future seemed meagre, basic strengths existed that helped materially in finding the answers to development problems and ensuring their rapid and intelligent application. By 1910 the political, economic, and social environment was favourable to the expansion of agricultural production.

The country was politically stable and the electorate was prepared to accept at least some Government participation in economic affairs, as exemplified in the land, labour, and social legislation of the 1890s and the early years of this century.

The basis of the system of Government administration we have today had been laid.

An equitable fiscal system was established and a national network of transport and communications was almost completed.

Broadly, there was general acceptance of the State's carrying some of the burdens that in earlier years had to be shouldered by the individual.

In such an economic and social environment farmers could develop their properties with confidence.

A national system of primary education since 1878 and free secondary education for about a decade had, by 1910, created a high level of literacy and fertile ground, even in the most isolated country districts, on which published results of advances in agricultural science and practice could fall.

Alliance Between Farmer and Scientist

The First World War in 1914-18 temporarily overshadowed the golden age that seemed to be dawning, but with the coming of peace enough qualified men could be assembled to tackle the most urgent problems of agricultural development. The alliance between the farmer and the scientist that in the past 30 to 40 years has paid such worthwhile dividends is abundantly evident in the pages of the 50 years' issues of the "Journal".

In setting to work on the improvement of grassland the early workers whose results and recommendations, as reported in early issues of the "Journal", stand up so well to scrutiny in the light of today's advanced knowledge, had few or no models from abroad to guide them. Their results, readily accepted and applied by an educated and intelligent farming community, laid a foundation on which an enviable reputation as a grassland farming country has been built.

Lessons from Experience

Our successes in the past 50 years place an obligation on us today, when, with many other countries, we are committed to help the less developed countries to better their lot. What is the most effective form our aid can take? What lessons from our own experience can be applied by countries which with limited resources of skill and knowledge are trying to expand their agricultural and industrial production, introduce modern social services, and play a fuller part in world affairs?

Contributors and Other Helpers

PREPARATION of material for publication in the "Journal" has always been a Departmental team job. This was markedly more so for our jubilee issue. It would be impossible to acknowledge all contributors. On our contents page and with some articles we have printed the conventional by-lines where the personal contribution has warranted it, though this should be an indication for receipt of any credit, not for blame; in compressing coverage of such a wide field into a small compass, editorial adjustments have affected nearly all the content. An overflow of material will appear in supplements in the next two issues.

The encyclopaedic knowledge of the Director-General, Mr P. W. Smallfield, of New Zealand's agricultural development generally and of Departmental activities and personalities has been of inestimable value in the planning and preparation of the content of the issue.

Data, information, and photographs have been drawn from many sources, only some of which can be acknowledged. The Turnbull Library's photographic collections have been freely drawn on and the assistance of its staff is acknowledged.

This issue, like all its 600 predecessors, owes most to the good will, exceeding the demands of normal duty, of all Departmental officers, both past and present, who have had a hand in it. Thanks are no less due to the editorial and printing staff on whom its preparation has thrown more than the usual burden; and to our advertisers, whose support over the years fully entitles them to share in our celebrations—*Editor.*

Fifty years ago we were faced with not dissimilar problems, and though there may not have been then the sense of urgency there is today, our scientific resources were even more limited and there was little chance of supplementing them from abroad.

One of the reasons for our success, as shown in the "Journal", may have been that we did not try to move forward on all fronts at once. Particular problems were concentrated on by small teams of research workers. This may have resulted in progress being uneven, but it meant effective use of limited resources and has won some notable victories.

Role of Continuing Service

Though we may be justly proud of the high level of efficiency our system of grassland farming has attained, we are finding that livestock production keyed to such a pitch produces its own problems. Management becomes more complex and some of the metabolic animal diseases associated with high stocking rates and intensive use of pasture are presenting new difficulties.

There should be abundant opportunities in the future for the resourcefulness of research and advisory workers; and a part for the "Journal" to continue to play in fulfilling the role envisaged by its founders of giving "early and timely publicity" to their results and recommendations.

C. F. SKINNER, Minister of Agriculture

The Path to PROFITABLE FARMING

OFTEN by nature, sometimes because of force of circumstances, New Zealand farmers have been receptive to those who could help them and accordingly an advisory service has grown proportionately with the needs and importance of the industry. An important link between the man on the land and the growing fund of agricultural knowledge has been the agricultural instructor—today the local field officer of the Farm Advisory Division of the Department of Agriculture. The need for such officers to provide information quickly to as many farmers as possible was one of the strongest reasons for the launching of "The New Zealand Journal of Agriculture" 50 years ago.

A PATTERN of farming was established in New Zealand only after much trial and error and those who were first called on for advice had very little precise information related to New Zealand conditions. Nevertheless even in the early issues of the "Journal" the officers of the Fields Division (the forerunner of the present Farm Advisory Division) were able to offer much sound general information and opinions which showed acute perception.

The liaison between the farmer and the agriculturist grew stronger with the expansion of farming and the search for greater efficiency. Succeeding volumes of the "Journal" reveal the ever-increasing scope of inquiry into practical farming problems.

Early field instructors were virtually agricultural "G.P.'s", but it soon became evident that for intensive investigation specialisation was necessary. Eventually this embraced not only the more tangible aspects of agriculture, but economics and sociology, and for a time these sections were split off under the control of a separate Rural Development Division. However, these activities were again integrated with those of the Fields Division with the formation in 1948 of the Extension Division (the "Journal", August 1948).

Today the agriculturist in New Zealand operates in an environment in which animal husbandry and pastoral problems are almost indivisible and this has further altered the emphasis on what the instructor needs to be able to impart. So the renaming of the Extension Division in 1959 as the Farm Advisory Division not only more closely defined its function but indicated the pattern of the instruction it was henceforth to be organised to provide.

The guiding hand of the agricultural adviser is revealed in the following brief histories of various practices as they were developed and recorded in the "Journal" during the last 50 years.

SOILS

1. Soil Surveys and Soil Testing

NEW ZEALAND soils in their natural state were not generally fertile, and even in the early days farmers knew that manures were essential for the good growth of crops. Later came the realisation that grassland farming, to which they seemed inevitably committed, was likely to succeed only if they could improve soil fertility. Farmers therefore were receptive to any counsel that would assist them with the problem of deficiencies of the soils from which somehow they had to earn a livelihood.

IT is not surprising therefore that one of the most prolific early contributors to the "Journal" was the pioneer soil chemist B. C. Aston, who for many years was the Department's Chief Chemist. His study of bush sickness (which will be discussed in the jubilee supplement in next month's issue), subsequently proved to be due to cobalt deficiency really threw the spotlight on to soil investigations.

As early as 1911 the Department was prepared "to analyse soils for farmers and to supply advice as to the best manurial treatment." (The "Journal", June 1911.) A lot more faith was placed in soil chemistry alone in those days than subsequent

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investigations have shown to be justified. With the development of both soil surveys and soil testing over the years has come a growing realisation of the complexity of these subjects and the work that is necessary to establish the two services with an adequate scientific background to give the basis for sound advisory work.

From time to time Aston published tables of soil analyses and gradually an interest in the peculiar and differing properties of our soils was aroused. Volume 18 of the "Journal" (1919) recorded a resolution of the first meeting of the Science Congress of the New Zealand Institute that a soil survey be undertaken as soon as possible. In the following years the "Journal" recorded descriptions of various soils and then in September 1923 Aston said "a complete soil survey will come in time" and that "approval has been given to the resumption of the North Island reconnaissance soil survey interrupted by the war."

In issues of the "Journal" between 1924 and 1927 Aston described a reconnaissance soil survey of pumice soils. His article in June 1926 included the first soil map published in the "Journal".

The establishment of the Soil Division (now Soil Bureau) of the Department of Scientific and Industrial Research in 1930 marked the beginning of intensive soil survey work on a national basis. Apart from Cawthron Institute it soon became the main organisation in this field. Numerous articles in recent years contain reference to soil types as defined and described by Soil Bureau workers, and their surveys have been the foundation on which much of our present knowledge of soil fertility has been built.

References to soil testing appear from time to time throughout the "Journal's" 600 issues, but not until the establishment of the Soil Fertility Research Station* in 1946, recorded in the November 1946 issue, was a soil testing advisory service for farmers placed on a national basis. At first the service was free, but with its expansion (announced in the December 1952 "Journal") to provide a modern service a charge was made to cover costs. The value of such a service backed by sound research and interpreted by skilled advisory officers is now well recognised.

Soil sampling on virgin country.

---

* Later renamed the Rukuhia Soil Research Station.

2. Use of Fertilisers and Lime

FREQUENT references to experiments on crops and pastures with a variety of fertilisers and lime are to be found in the early volumes of the "Journal". Such trials compared complex mixtures of organic and inorganic fertilisers and appear today most difficult to interpret because of the approach to the problem. Today we try to isolate and examine each element of the fertilisers concerned and recognise the need to relate the results to soil type, previous fertiliser applications, cropping history, and type of pasture and crop, to name but a few of the factors involved. Data on fertiliser responses published in the early volumes, without such information, are of limited value today. Nevertheless this work laid the foundation for the present fertiliser industry.

IN the "Journal" in 1912 Aston listed the quantities of fertilisers imported into New Zealand for the year ended 31 March 1911. It included superphosphates 27,442 tons, bonedust 11,058 tons, guano 15,858 tons, and a host of other products. In Volume 7 (1913) Aston stated: "Gypsum. . . is imported in considerable quantity from South Australia." This material may now be finding a new place in New Zealand fertiliser use, but many of those imported 40 or more years ago are little used today.

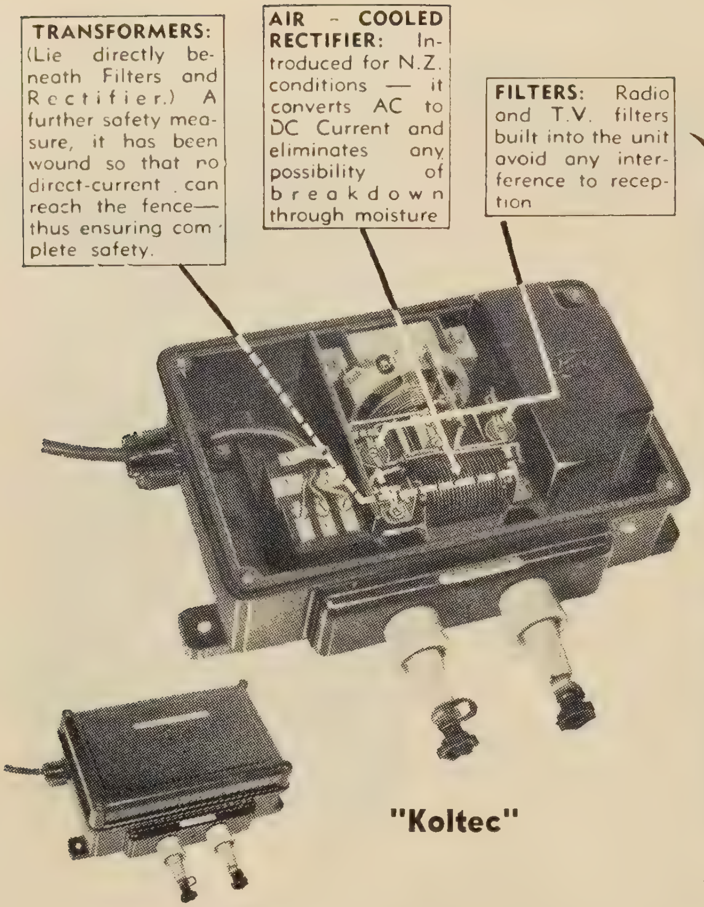
Phosphates

The first of an important series of articles on fertilisers by Aston appeared in the "Journal" in July 1913. Significantly, it was entitled "Phosphates, Their Importance to New Zealand Farmers", and in it he stated: "Our own Otago mines are now turning out 8,000 tons of marketable phosphate yearly." However, this source (at Milburn) soon proved quite inadequate for the demand, and the deposit has produced only small amounts at irregular intervals.

Developments which were to prove of vital importance to farming in New Zealand are foreshadowed in a report by the president of the Board of Agriculture published in the December 1919 "Journal". The report included the statement that ". . . it would be greatly to the advantage of New Zealand that the proposed agreement . . . for the administration of Nauru, and for the distribution of phosphates from the island, be ratified."

This agreement between Australia, Great Britain, and New Zealand, under which Nauru and Ocean Island are worked by the British Phosphate Commission has proved of immense importance to farming in this country, so dependent on supplies of imported phosphate for farm production.

The extraordinary circumstances that led to Sir Albert Ellis's discovery of the extensive Nauru deposits were recounted by him in the "Journal"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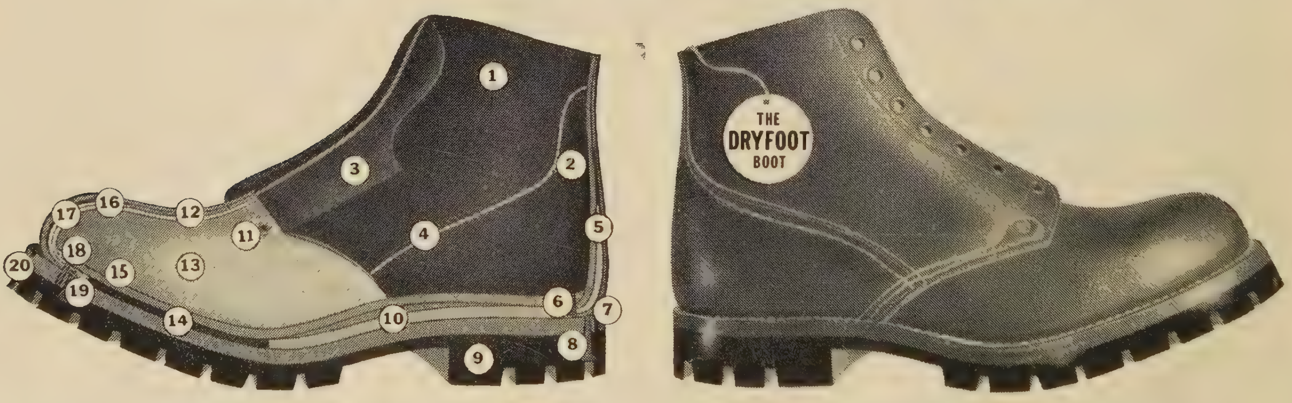
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in December 1920 in the article "Nauru and Ocean Island: Story of the Phosphate Discoveries and Workings". Thirty years later the same author was to describe the rehabilitation of Nauru and Ocean Island after damage to installations during the war and occupation of the territories by the Japanese (the "Journal", March 1950).

There was widespread interest in Ellis's article because the country was still affected by the fertiliser shortage, due to loss of sources of supply and shipping difficulties during and immediately after the Second World War.

Wartime shortages had led to rationing and other expedients to eke out the quantities available. Details of these were given in various "Journal" articles throughout the period and were summarised in G. H. Holford's comprehensive survey "Fertilisers: History of Supplies in War and Peace" in July 1946.

One method of conserving phosphate was the manufacture of serpentine superphosphate (a mixture of ground serpentine rock produced locally and imported superphosphate). This material had advantages (referred to in a detailed article on serpentine superphosphate in the September 1941 "Journal") that have led to increasing use of it.

Aerial Topdressing

With the introduction and large-scale development of aerial topdressing in the 1950s it became possible to apply phosphate economically to millions of acres of hill country. This revolution is traced in a series of "Journal" articles of the time. A. N. Tait in a history of the use of fertiliser in New Zealand in the "Journal" of August 1957 records that in 1956 aerial applications absorbed a third (400,000 tons) of the available fertiliser.

Potash, Nitrogen, and Sulphur

Potash

Aston stated in the 1916 "Journal" that: ". . . only for special crops. . . are New Zealand soils immediately in need of potash manuring. . .", but, a few years later, deficient soils were discovered. Some potash responses in Auckland Province were recorded by T. H. Patterson and J. W. Woodcock (now Director, Farm Advisory Division), in the September 1927 "Journal". The need for potash became more manifest with intensive farming on many North Island soils, and the known potash responsive areas were described in various issues of the "Journal" from 1937 onward.

Nitrogen

The studies of nitrogen requirements of soils recorded in the "Journal" over the years led to the realisation that bacterial fixation of nitrogen by vigorous clover growth and the return of dung and urine by grazing animals were a more economic method of supplying pastures with nitrogen than the use of artificial nitrogenous fertilisers. Of the many experiments with nitrogenous fertilisers on pastures the most comprehensive series was that on dairy pastures during the 1928-29 and 1929-30 seasons, results of which were recorded by A. W. Hudson and Woodcock in the February 1931 "Journal".

Sir Albert Ellis, discoverer of the extensive phosphate deposits on Nauru which have proved so valuable to New Zealand agriculture.

Recent issues have dealt with special uses for artificial nitrogen: for crops and for out-of-season growth of pastures particularly.

Sulphur

A response to sulphur at Ruakura is recorded in the "Journal" in 1913. Sulphur then seems to have been forgotten for many years, but in 1929 R. B. Tennent* and A. S. Duff recorded responses to sulphur on lucerne in Central Otago and this work was confirmed in subsequent years. However, only in recent years has the widespread nature of sulphur deficiencies been recognised.

Lobb recorded in June 1953 sulphur responses in North Otago and in the following years frequent references were made to investigations in that and other areas. The need for illustrating satisfactorily responses from sulphur and other fertilisers was one of the reasons for introducing the colour section into the "Journal" in 1955.

Minor Elements for Plant Growth

The early investigations into bush sickness suggested that it was caused by iron deficiency. Though this was later shown to be incorrect, the theory led to much work with iron compounds. Iron deficiency in pastures or crops is now considered to be very rare, though in the "Journal" in 1959

Quarrying rock phosphate at Milburn, Otago. (The "Journal", July 1913.)

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* Director-General of Agriculture, 1958.

AERIAL TOPDRESSING

	Tons	Acres
1950 ..	5,003	48,741
1951 ..	44,957	428,737
1952 ..	88,869	802,212
1953 ..	144,802	1,376,118
1954 ..	203,110	1,929,499
1955 ..	279,006	2,783,802
1956 ..	404,933	3,853,169
1957 ..	428,245	3,445,586
1958 ..	465,733	4,159,464
1959 ..	403,206	3,515,128
*1960 ..	460,843	—

* Estimate

F. C. C. Hupkens van der Elst records responses of pasture on peat to iron.

Not until relatively recent times has the possibility of minor element deficiencies in New Zealand soils received much attention. In the February 1929 "Journal", T. (later Sir Theodore) Rigg, after attending an international soil congress at Washington reported: "Several workers. . . pointed out. . . the importance of small traces of such chemical elements as boron, manganese, and copper in plant nutrition." Field trials with boron to control brown heart in swedes were reported on in the August 1936 issue.

Interest in minor elements for plant production was stimulated by the discovery of molybdenum deficiencies. Earlier work had been done into the use of molybdenum for the control of whiptail of cauliflowers, but the first major article on pasture responses to molybdenum appeared in the October 1951 "Journal", in which responses in Otago and Southland were recorded.

This was soon followed by details of other investigations and there was a renewed interest in a number of other minor elements. This remains a live topic. Discoveries of minor element deficiencies and the ways to overcome them have led to marked economic advantages to New Zealand agriculture.

Lime

Lime has long been recognised as necessary for maximum plant production on many soils of this country. Aston recommended the use of lime and phosphates on the pakihi lands of Westport in the "Journal" in 1913 and in the following year he summarised the value of ground limestone on New Zealand soils. There is frequent mention of lime needs and lime responses in subsequent years as soil after soil was discovered to be in need of this material. In 1916 W. D. Hunt said: "The effect of lime on our South [Southland and South Otago] grasslands. . . is nothing short of marvellous."

Sir Theodore Rigg, who drew attention in the "Journal" in 1929 to the possible importance of trace elements.

Lime use developed rapidly. W. Faithful (the "Journal", March 1952) gives an interesting account of its history in Southland.

Peak production of lime was reached about the time widespread molybdenum deficiencies were discovered (the early 1950s). Lime use has declined somewhat since then, due in part to the greater availability of fertilisers, but also to the discovery that the need of some soils for very heavy lime dressings was associated with their need for molybdenum. One effect of heavy liming was to make soil molybdenum more available to plants. This point is made by most writers on molybdenum trials, such as S. M. J. Stockdill (the "Journal" 1955). Nevertheless this is not the only beneficial effect from liming and there will always be a need for substantial dressings of lime on most of our soils.

PASTURES AND CROPS

Seed Testing

SINCE its inception in 1910 the "Journal" has given much publicity to all the phases of seed testing: Early issues referred to the need for such a service and later ones have traced its establishment and described how official seed testing protects the interests of both farmers and the seed trade.

IN 1910 the "Journal" reported the Minister of Agriculture as informing the Dominion Conference of the New Zealand Farmers' Union that he "had a Seeds Bill on the stocks that dealt with . . . not only their purity but their germination." He referred to the subject again in an address to the New Zealand Agricultural Conference (the "Journal", September 1911): "This session I am placing before Parliament a Seeds-control Bill which has for its object the penalising of low-grade seed. The necessity of such legislation should in reality never have arisen here if the farmers had only acted as has been done in Europe."

The Minister said that in Europe the system of seed control had been built up largely without any special legislation, relying for its continual support on the demands of the farmer himself for guaranteed seed. Under this scheme, seed firms sent samples of their seed to the nearest control station to be tested for purity and germination and the issue of certificates of analysis. Any purchaser had the opportunity to have the seed retested.

"In this way," said the Minister, "the purchaser is fully protected without any special legislation embodying an elaborate inspection system which the enforcement of the law would require." In Europe, he said, the farmer had demanded guaranteed seed, which the seedsmen had found it necessary to supply to keep their trade. In New Zealand some farmers cared little for the quality of the seed they sowed, provided the price was low, and the result was that the best seed was always at a disadvantage.

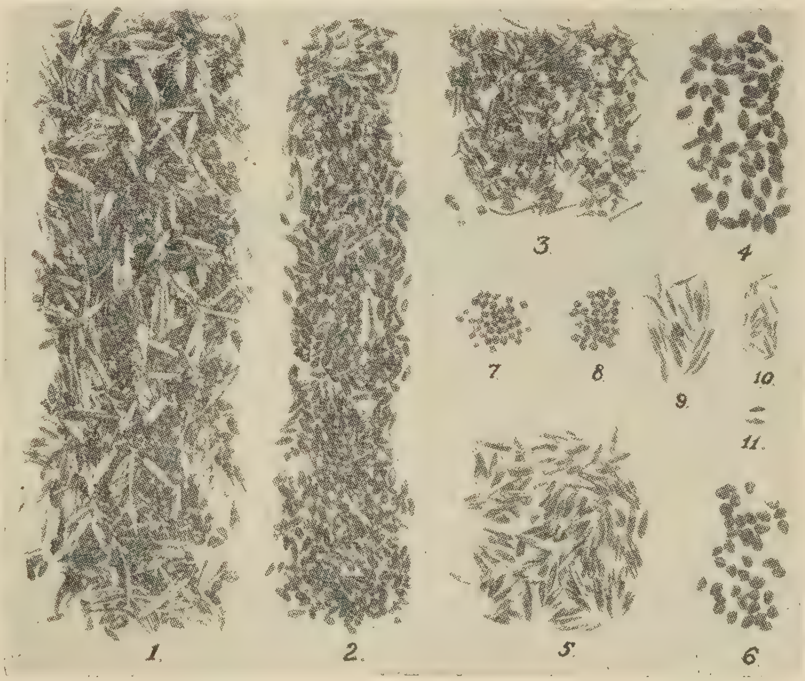
Though in 1920 A. H. Cockayne* referred to a "Seeds Bill which has now been prepared," no legislation governing the testing and sale of seeds has yet been enacted. For, wittingly or unwittingly, the Minister had described in his address to the Agricultural Conference exactly how seed testing in New Zealand would develop. Over the years farmers generally have given the lie to the comment that "some farmers care so little for the quality of the seed they sow provided the price is low." Nevertheless throughout the life of the "Journal" the accusation has not been without some truth, as is borne out by the frequent references to undesirable lines of seed.

Impurities in Seed

T. W. Lonsdale warned the farmer in the April 1911 "Journal" that ". . . he should be careful to see that it [the seed] is pure, especially that no seeds of noxious weeds are present." He also stressed the importance of germinating power. His observations recorded an improvement in the purity of farm seeds in the previous decade, the outcome of efficient machine dressing by local seed merchants. The "Journal" also offered the assistance of the Biologist of the Department in determining seed germination.

Cockayne in May 1911 drew attention to the practice of adulterating lucerne seed with other less valuable seeds of the same species. However, he added, the practice was "more or

Analysis of a gramme of a → "cheap" seed mixture offered to farmers 40 years ago: 1—A gramme of the mixture. 2—Weed seeds, 53 per cent. 3—Dirt, etc., 9 per cent. 4—Australian flax, 7 per cent. 5—Perennial ryegrass, 18 per cent. 6—Red clover, 6.5 per cent. 7—*Lotus major (uliginosus)*, 2 per cent. 8—White clover, 1.5 per cent. 9—Cocksfoot, 1.5 per cent. 10—*Poa pratensis*, 1.4 per cent. 11—Crested dogstail, 0.4 per cent. There were also traces of suckling clover and Yorkshire fog. This mixture contained only 31 per cent of useful seed; the rest was rubbish.



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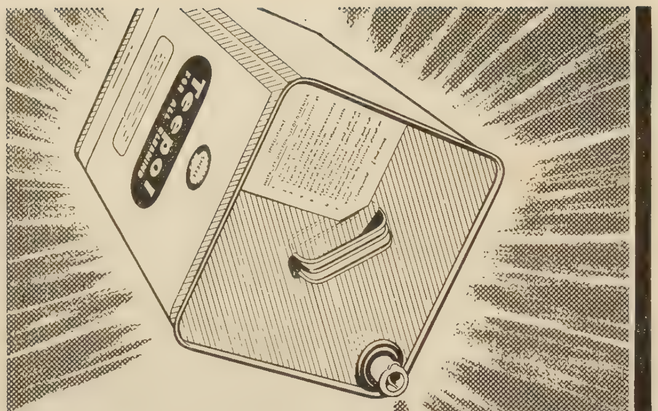
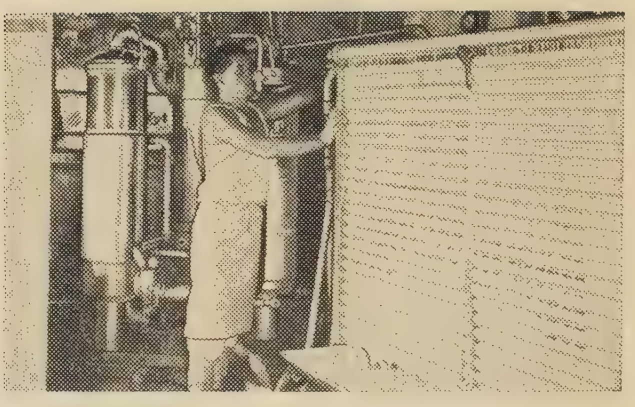
* Biologist, Department of Agriculture; Director-General, 1936-43.





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less unknown with regard to Australian or New Zealand grown seed."

A good indication of how weeds were spread is given by a purity analysis of a sample of New Zealand grown timothy seed, details of which were given in the July 1911 "Journal". The sample contained 5.7 per cent of weed seed, including an estimated 41,374 ragwort seeds per pound.

The Department offered to farmers in 1912 a "Practical Guide to Weed Seeds" in the form of a reference card containing a collection of the most commonly occurring weed seeds. The reference card was illustrated in the May "Journal" of that year.

"Bargains" in seed purchases referred to by Cockayne in the June 1912 "Journal" included: White clover seed of 64 per cent purity and 33 per cent germination (21 per cent of pure living seed) offered at more than two-thirds the price of good white clover seed; red clover containing 10 per cent of weed seeds of 16 different kinds, including dodder at the rate of 8,000 seeds per pound.

"At a moderate estimate," said Cockayne, "weeds diminish the annual producing power of our land by at least 5 per cent . . . a yearly loss of nearly £1,000,000 sterling on our agricultural exports alone."

Later Cockayne deemed it necessary to emphasise "the urgent need for germinating all perennial ryegrass before it is sown." (The "Journal", September 1912.) In the same issue attention was drawn to the announcement in a local seed catalogue which invited farmers to have their seed grain machine dressed for 3d per bushel. "This modest charge, coupled with the fact that the Government railways carry the seed grain one way free, should encourage general adoption of dressing the seed for all grain crops," the "Journal" commented.

Cockayne kept up his attack in the "Journal" on impure seed: "It can be taken as an axiom," he said in the May 1913 issue, "that seeds offered below their ordinary market value are **always expensive**. The reverse is, unfortunately, not always true. . . " He added: ". . . the Department has now a small but fairly well equipped laboratory for . . . seed testing." He enlarged on the functions of a seed analyst, discussed the relationship between purity and germination, and showed how the "real value" (pure living seed content) of a sample was determined.

The adulteration of white clover seed was referred to by the same author in 1911 as a common practice that had been in vogue for many years.

The "Journal" in May 1916 announced the introduction of a scale of charges for seed testing and the procedure to be adopted in submitting samples and reporting results. It recorded: "It is pleasing to note that communications. . . from the leading seed firms in the Dominion unanimously approved the new system. . ."

In the May 1917 "Journal" E. B. Levy, of the Biology Section, emphasised the need of seed testing in these words: "The advisability of knowing the purity and germination capacity of the seed we sow has again and again been demonstrated by commercial samples of seed that have been received into and analysed in this section's laboratory."

Seed Testing Explained

In a detailed outline of the New Zealand official system of seed testing in the February 1918 "Journal" Levy stated:

> The Seed-testing Station of the New Zealand Department of Agriculture has now been established for 10 years, but so far no enactment has been passed making seed testing compulsory in the Dominion. The necessity for compulsory testing has been obviated to a large extent by the seed merchants themselves recognising the necessity of knowing the quality of the goods they are offering.

The volume of seed testing had grown from 180 samples in 1910 to 3,859 samples in 1918.

Seed "bargains" apparently continued to tempt farmers because warnings about so-called cheap seed were again issued in the "Journal" in April 1922 by N. R. Foy and in June 1923 by Levy.

In 1925 (the "Journal", December) the Seed-testing Station was authorised by the Canadian Department of Agriculture to issue certificates verifying that parcels of seed exported to Canada complied with the minimum requirements of the Canadian Seeds Act 1923.

The Seed-testing Station participated in the 1927-28 season in testing of a series of referee samples organised by the International Seed Testing Association, results indicating a high standard of work by the New Zealand Station (the "Journal", November 1928). The December 1928 "Journal" recorded that the New Zealand Station had become a member of the International Association.

In 1928, when the Seed-testing Station was transferred to Palmerston North, 10,149 samples were received for testing.

New Tests Developed

Studies in the use of the ultra-violet light as a laboratory test for the determination of strain in perennial ryegrass seed grown in New Zealand were discussed by Foy in the December 1931 "Journal". This test was later adopted as a standard laboratory test for certification of perennial ryegrass seed.

An abnormality in the kernels of perennial ryegrass seed which appeared to be associated with the failure of such seed to germinate was reported in an article by E. O. Hyde in the May 1932 "Journal". Abnormal kernels revealed the presence of hyphae of a fungus, later identified by J. C. Neill and Hyde as a parasitic fungus, which they named "blind-seed disease".

Germination deterioration in Chewings fescue seed shipped to North America and Europe caused concern in the early 1930s because of possible falling off of interest in this New Zealand product, for which there was a steady demand. As a result of an investigation conducted by Foy (the "Journal", July 1934) artificial drying and packing in moisture-proof bags before shipment were recommended.

Foy and Hyde (the "Journal", October 1937) demonstrated the relationship between the picric acid seed test on white clover seedlings and the plot test in determining strain in New Zealand white clover and outlined the value of the picric acid test as an adjunct to the certification scheme for which it has become a standard procedure.

Despite the regular warnings of earlier years, the "cheap seed racket", as Foy labelled it, was still flourishing in 1939. Writing at that time Foy said: "The Government, through the Department of Agriculture and in co-operation with the established seed trade, has made it possible for all farmers to secure reliable seed supplies, but it is essential that care be exercised in selection and purchase."

Importance of Seed Testing

The view expressed by the manager of a large seed trading firm that, "As between merchants, a Seed-testing Station certificate is a first and final law," is quoted in the "Journal" of January 1942. This issue carried a detailed article on the Station's work, and this was similarly surveyed in the March 1950 issue by A. V. Lithgow, Officer in Charge. This article noted that 49,000 samples were handled during 1947. "The keen buyer," said Lithgow, "demands evidence that the seed he buys is good, tested by stations whose efficient service is his guarantee."

A pictorial article of the work of the Seed-testing Station which appeared in the May 1956 "Journal" showed how seeds were soaked in a tetrazolium salt to establish rapidly whether they were viable.

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Seed Certification

FROM its earliest issue the "Journal" has laid emphasis not only on the importance of plant selection, but on the necessity to be able to identify the seed of the selected plants. Writing in September 1910 A. H. Cockayne (then the Department's Biologist) had visions of an organisation which would undertake this identification:

> **"Farmers growing these new types for seed purposes would, through the agency of the station, have their fields periodically examined to see that they were true to the type originally sent out by the station . . . and ultimately every sack of seed sold by the grower would have its pedigree tag . . ."**

A SIMILAR thought was in the mind of the Hon. T. Mackenzie, Minister of Agriculture, when (as reported in the "Journal") he told the 1911 New Zealand Agricultural Conference:

> The ultimate aim of seed control must be in the direction of guaranteeing to the farmer that the seeds he buys have been grown under proper conditions and are absolutely true to strain . . . and when that time arrives when most of the agricultural plants grown in the Dominion are forms that have been bred here, for the various special conditions that are demanded of them, a somewhat analogous system [to that of field inspection operating in Europe and America] will be imperative.

J. H. Claridge, present Chief Advisory Officer (Agronomy), who has been closely associated with the seed certification scheme from its inception and has been in charge of seed certification work since 1935.

Not until 1916, however, was the "Journal" able to record the first move to establish an independent identification of the seed of plants selected in New Zealand for New Zealand conditions. In that year Dr F. W. Hilgendorf, of Lincoln College, who had been actively engaged in selection of wheat varieties wrote to the "Journal" to publicise the activities of the newly formed Canterbury Seed Growers' Association. "The Association exists," he said, "for the purpose of providing good and pure seed to farmers. It consists of farmers who have appointed an inspector to examine their crops and seed . . ."

Under this scheme "registered" seed of three wheat varieties, College Hunters, White Tuscan, and Solid Straw Tuscan, were initially available. Other wheat varieties were included in the scheme later. The results of three seasons' activities were reported in the August 1918 "Journal".

Department Takes Over

Cockayne in 1921 referred to an attempt made by Dr Hilgendorf and the Canterbury Seed Growers' Association to check mixing of strains and varieties of wheat, but said the work had become "too extensive to be coped with by private and voluntary effort." Cockayne continued:

> The Department of Agriculture has now undertaken the maintenance and distribution of these improved seeds. This season [1920-21] farmers who were known to have obtained pure seed were written to and invited to assist in keeping it pure. . .

Under this scheme the Department agreed to purchase the bulk of the resultant crop of approved areas for sale to seed merchants and 10,000 bushels of seed were available from the 1921 harvest. The "Journal" in January 1924 commented on the difficulty of obtaining pure seed wheat in New Zealand and announced the intention of the Department to inspect wheat crops of farmers who had bought pure seed from Canterbury Agricultural College the previous year.

[*Weigel*

J. W. Hadfield, Agronomist, Department of Agriculture, Christchurch, who introduced the seed wheat certification scheme in 1927.

This attempt to introduce a satisfactory scheme for the identification of seed of pure lines of wheat appears to have been unsuccessful, as in April 1928 J. W. Hadfield, Agronomist, Christchurch, announced that a system of seed wheat certification had been inaugurated in the 1927-28 season by the Department of Agriculture in cooperation with the newly formed Wheat Research Committee (now Institute). "The object of certification," said Hadfield, "is to render available to merchants and growers lines of seed reasonably pure and free from disease." The methods adopted to achieve this aim and the results obtained in the first season were outlined.

Seed Potatoes

In 1927 details of a scheme for the certification of seed potatoes to be controlled by the Department of Agriculture were outlined by Hadfield, and in December of that year the "Journal" listed 138 entries, representing 20 varieties, from growers.

Results of the first season's operations were reviewed by Hadfield in the May 1928 issue. Hadfield and

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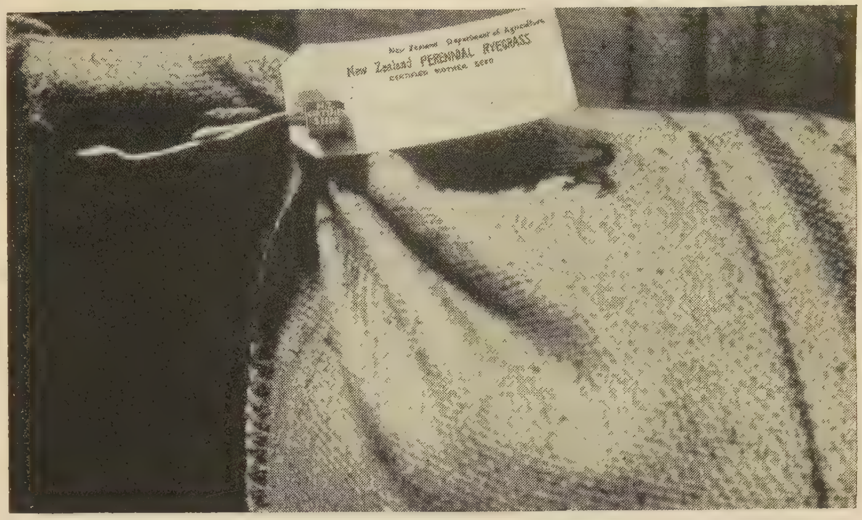
J. H. Claridge (now Chief Advisory Officer (Agronomy)) in discussing the information gained from the first season's operations hoped they would "prove beyond all doubt the imperative need of some system whereby growers may be guided in the selection of the seed they plant."

An intimation that the certification scheme was to be extended to include pasture seeds was given by Cockayne (by now Director, Fields Division) in a "Journal" article in February 1929, and introduction of a scheme of certification of white clover seed was announced briefly in the next issue. Hadfield in November 1929 outlined proposals for the certification of perennial ryegrass and browntop seeds also.

The scheme of certification had been successfully launched. Subsequent issues of the "Journal" contain frequent references to its steady extension to all the major pasture and crop seeds used in New Zealand.


New Zealand Department of Agriculture
New Zealand PERENNIAL RYEGRASS

The official identification for certified seed.

An indication of the progress made in 30 years with grass and clover seeds was given in a review by Claridge of the scheme up to recent times published in 1958. By then the proportion of the total production of certain seeds which qualified for certification was: Perennial ryegrass, 75 per cent; Italian ryegrass, 70 per cent; white clover, over 90 per cent. The proportions certified of other pasture species were: short-rotation ryegrass, 85 per cent; browntop, 80 per cent; cocksfoot, 65 per cent; Montgomery red clover, 60 per cent, and cowgrass 45 per cent.

"The [certification] procedure adopted has simplified the whole question of maintaining strain purity . . ." said Claridge. ". . . it is undertaken to provide the buyer with an assurance as to the strain of the seed and not for any specific benefit it may confer upon the grower of the seed."

Saving of Winter Grass

FOR many years winter and early spring feed for dairy cattle was provided by supplementary crops, silage, hay, and poor roughage. In the late 1920s attention was paid to the possibility of growing pasture in late autumn and early winter and saving it for use in late winter and early spring.

IN the August 1927 "Journal" P. W. Smallfield, Instructor in Agriculture, Ruakura (now Director-General) stated:

> In order to provide sufficient protein-rich feed for the early spring it is usually necessary to save a considerable amount of the winter growth of grass by almost completely maintaining the cows during their dry period on hay, ensilage, and roots. Grass can be most successfully saved for the spring when the pastures are topdressed in the early winter and consist very largely of perennial ryegrass.

This practice gained general acceptance fairly slowly, mainly because many of the pastures then used for dairying were comparatively low producing, being particularly weak in winter producing species. However, by 1949 the "Journal" could report:

> During the past decade the saving of autumn-grown grass for winter and early spring feeding to dairy cows has become established as a farm practice in New Zealand.

Undoubtedly one of the factors which encouraged the use of autumn saved pasture was the introduction of the electric fence. This was first used in New Zealand about 1937, mainly for the break feeding of root crops and the fencing off of hay and silage stacks. An early enthusiast was Mr C. S. Brook, a Te Kuiti farmer, who in the "Journal" in June 1939 wrote that ". . . electric fencing opens up a new hope for closer subdivision." Mr. Brook used this type of fence for subdividing 103 acres into 16 paddocks and commented that time had proved the fence "an unqualified success."

Before long the electric fence was being used on an increasing scale for the rationed feeding of winter pasture. Though by 1949 the practice had become widespread, farmers continued to experiment a great deal to devise the most efficient methods both of grazing and of placing fences in relation to water supplies and according to labour available.

J. M. Hopkins in the December 1949 "Journal" described a system of growing winter grass and feeding it off as practised on a farm at Levin. He stated: "The main requirements in break feeding of saved pasture are a light and simply constructed electric fence unit which can be moved easily and a system embodying the quick easy shifting of the break fence itself. Both these points are important and they are essential where a daily ration of saved pasture is fed to dairy cows."

Today the saving of winter grass is a normal practice on most North Island dairy farms and is being adopted increasingly on farms in the South Island.

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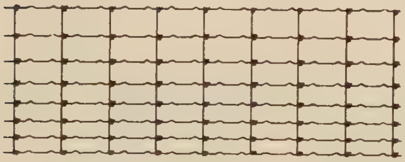

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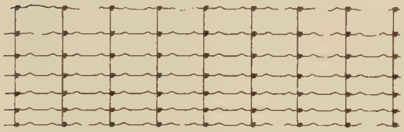

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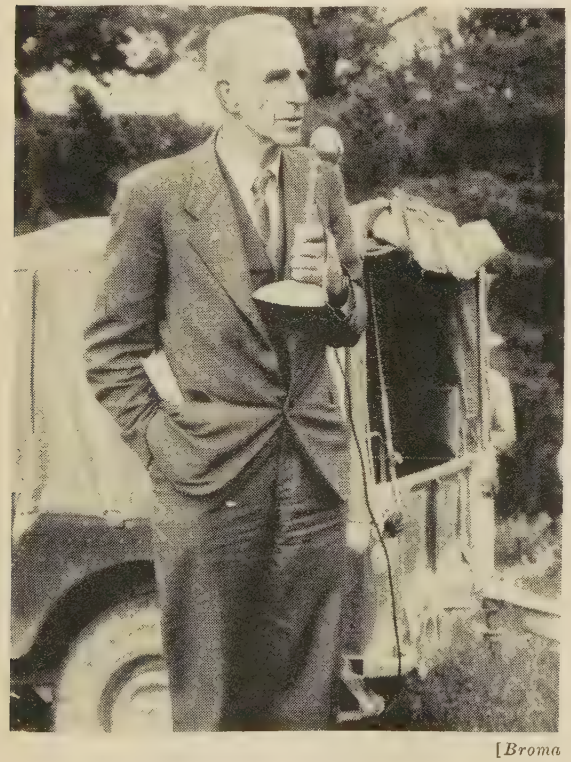
Development of Field Experiment Techniques

IN 1900, 10 years before the first issue of the "Journal", the Department of Agriculture was doing a considerable amount of testing of varieties of pastures and crops. A series of farmers' cooperative trials with fertilisers was organised by B. C. Aston in 1908 and ran from 1908 to 1916. In July 1912 a "Journal" advertisement invited farmers to have cooperative trials on their farms. These early trials, though simple in design, often contained a great many treatments. Differences between treatments were large, and simple trials often gave sufficiently reliable results.

The first trial where all treatments were repeated an equal number of times was laid down on pasture on the farm of Mr C. Harrison at Te Kumi, 2 miles from Te Kuiti, in August 1921. This photograph was taken just after the plots were cut for hay in January 1922.

IN the June 1923 "Journal", however, F. W. Hilgendorf and J. W. Calder of Canterbury Agricultural College gave results of a trial on methods of harvesting wheat where for the first time a fully replicated trial was used consisting of 5 treatments each repeated 31 times. This work stimulated workers in field experiments to adopt modern designs. For many years regular designs were used where the treatments were in regular order (such as 1, 2, 3, 4, 5, 6) rather than in random order (such as 3, 4, 1, 6, 5, 2) as would be adopted today.


[*Broma*

A. W. Hudson, an outstanding pioneer in experimental techniques.

In more recent times experimental designs have become increasingly complex. The methods of analysis of the results have similarly increased in complexity and today require the services of highly trained mathematicians and skilled computers for their evaluation. Such advances are necessary to meet the increasingly complex problems that experimentalists are being called on to solve.

The technique of experimentation has made similar advances over the years. New Zealand has made notable contributions in this field, particularly with pasture experiments. An outstanding pioneer was A. W. Hudson, Crop Experimentalist, who in a series of articles beginning in the August 1931 "Journal" gave some of the techniques he developed. Hudson was also active in improving the technique of crop experiments and he published a comprehensive article on the subject in the 1926 issue.

The point method of pasture analysis was outlined by E. B. Levy* and E. A. Madden in the May 1933 "Journal". Whereas Hudson's work was mostly concerned with the measurement of pasture production, Levy and Madden's contribution was a method of determining the different species that made up a pasture and in this field it was a notable advance.

In more recent years we find increasing numbers of workers using modern methods of experimentation and a growing awareness of the need for good technique. In the March 1955 "Journal" Jean G. Miller summarised the history of field crop experiments in New Zealand and this article may be recommended to all who are interested in this subject. She traces in particular developments in experimental design.

A good example of the amount of information that a complex trial will produce is included in an article in the June 1954 issue in which Miss Miller and H. A. Browning gave the first three years' results of a complicated nine-year experiment on the manuring of market garden crops.

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* Director of the Grasslands Division, 1936-51.

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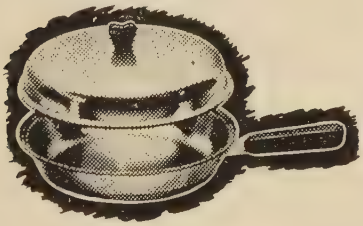

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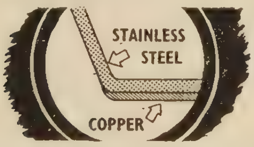

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Crop Varieties Produced for New Zealand Conditions

THE first "Journal" record of the development of a crop variety or selection designed for New Zealand conditions is contained in the June 1911 issue, which refers to A. W. Green's endeavours at Ruakura to make a rust-resistant selection from the imported oat variety Argentina. This selection was first named "Ruakura Rust-resistant", but the name was later changed (the "Journal", February 1914) to "Green's Ruakura" because of misunderstandings about the degree of its resistance to rust. This selection was described as clearly rust resistant under local conditions.

The late R. A. Calder, who played a leading part in crop improvement. The swede variety Calder was named after him.

A. H. COCKAYNE* in the March 1921 "Journal" traced progress made in the maintenance and distribution of improved seed wheat. He referred to work at Lincoln College culminating in the availability of seed of the selections College Hunters, College Solid Straw Tuscan, and College Pearl.

A small quantity of mangel seed of a selection made at Moumahaki from the White Sugar variety was available in 1921, according to the May issue of that year, which also included a report by J. Beverley that two varieties of peas raised at Weraroa and named Weraroa Strategy and Weraroa Imperial had passed out of the experimental stage.

Information about a selection of Algerian oats made at Lincoln College and known as strain A 86 (subsequently College Algerians) was given by F. W. Hilgendorf in the March 1923 "Journal". He said A 86 averaged out about 10 bushels per acre above commercial seed sown under the same conditions. The same author later reported the selection of superior strains of two other varieties and the release of seed under the descriptions "College Duns" and "College Danish" (the "Journal", August 1925).

Three Wheat Varieties Bred in N.Z.

CROSS 7 AOTEA ARAWA

Reporting again on work at Lincoln College in the improvement of oat and wheat varieties (the "Journal", July 1926), Hilgendorf referred to the performance of the "Bell" selection from College Hunters (later to be grown commercially for many years as Hunters II) and to the "B 49" selection of oats, a replacement of the A 86 selection grown commercially as College Algerians.

Potatoes

The origin of the two potato varieties Aucklander Short Top and Aucklander Tall Top was placed on record for the first time by J. W. Hadfield in the October 1928 "Journal". They had originated, he said, from later maturing, taller growing plants occurring over 20 years previously in a variety known as Suttons Supreme and had been selected by a farmer. The Aucklander Short Top variety has held a prominent place in the potato growing industry to the present day.

A Wheat Research Institute report in the June 1935 "Journal" referred to the breeding, performance, and release of the first variety of wheat (Cross 7) to be raised in New Zealand by artificial cross pollination. This wheat was in the following 20 years to be the dominant variety grown in this country.

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* Then Biologist, Department of Agriculture; Director-General, 1936-43.

Marked superiority of certified Giant rape (a selection made at the Plant Research Bureau) in comparison with the Broad Leaf Essex variety was noted in an item in the February 1938 "Journal".

The breeding and performance of two new varieties of field peas "Mammoth Blue" and "White Prolific", raised by the Agronomy Division of the Department of Scientific and Industrial Research, were described in the November 1942 "Journal" by R. A. Calder.

The availability of certified seed of two types of chou moellier, Giant and Medium-stemmed, and one of thousand-headed kale was recorded by J. H. Claridge and Calder in the May 1944 "Journal". These selections were made to obtain uniformity of types suitable for New Zealand conditions.

In the February 1948 issue O. H. Frankel and E. W. Hullett discussed the breeding and performance of Hilgendorf wheat, a variety of extremely high baking quality developed at the Wheat Research Institute and named after the late Dr F. W. Hilgendorf, the first Director of the Institute. The breeding and performance of a further variety bred at the Wheat Research Institute, WRI-Yielder, were discussed by Frankel in the March 1948 issue.

The work carried out to improve types of rape in New Zealand was outlined in the July 1949 "Journal" by Claridge. He recorded the availability of seed not only of improved strains of the standard Giant and Broad Leaf Essex types but of a newly discovered strain named Club Root Resistant, which exhibited pronounced resistance to clubroot disease.

The release of Government-approved swede seed of the Calder variety was announced in the August 1949 "Journal". Features of this variety (named after its breeder, the late R. A. Calder, Director of the Crop Research Division) are resistance to aphid attack and to infection by turnip mosaic and a strong rooting system which makes it suitable for conditions drier than those favourable to most swede varieties.

In the "Recent Research Work" feature in the "Journal" in July 1954 Cottier recorded the results obtained in a series of trials of a swede selection resistant to clubroot disease. Seed of this selection was later released for commercial sowing under the varietal name "Wye".

Methods employed at the Crop Research Division to develop an improved ryecorn for use as green feed were described in the May 1956 "Journal" by A. F. Greenhall. Seed of this improvement was released as Improved N.I.A.B. ryecorn, but for later releases the name was changed to C.R.D. ryecorn (the "Journal", January 1957).

Because of harvesting difficulties with the wheat variety Dreadnought a new variety, Arawa, was developed by the Crop Research Division as a replacement. The characteristics and performance of this wheat were described by L. G. L. Copp and W. R. Lobb in the September 1956 "Journal".

Perhaps the most striking of any wheat variety bred in New Zealand has been Aotea. In discussing the new variety in the March 1958 "Journal" Copp said:

> Aotea . . . has all of the agronomic features which made Cross 7 so popular, is more resistant to disease, is almost as good in baking quality, and yields about 23 per cent more.

Introduction of Subterranean Clover and Short-rotation Ryegrass

SUBTERRANEAN clover was regarded in 1910 (when the "Journal" was first published) as a rare plant occurring in waste places in Auckland Province. Today it is regarded as the most important of the annual clovers, and, of all the clovers, second in importance only to white clover. Subterranean clover gained importance from the recognition of two important facts: It responded to phosphatic fertilisers very well; it would thrive on country that was too dry in summer for white clover.

REGARDING the first point, C. J. Hamblyn wrote in the October 1925 "Journal": "Subterranean clover will not grow luxuriantly on the poorest soils; it demands a fertility standard almost as high as that for white clover. Therefore topdressing is essential."

The second point was well covered in the January 1935 issue by W. J. McCulloch who stated:

> . . . subterranean clover can play a very important part in increasing the production of the lighter, dry soils of this Dominion and . . . well merits further investigation in regard to strain and closer attention to management, etc.

Since then with the widespread adoption of topdressing with phosphates the use of subterranean clover has extended to almost all districts where soils are moist in winter but dry in summer.

Short-rotation Ryegrass

Though in the early 1930s attention was given by the plant breeders to the improvement of both perennial and Italian ryegrasses, it was felt that something better was required. In 1943 J. H. Claridge reported:

> In an endeavour to develop a type of ryegrass which, while having a degree of permanence greater than Italian, yet has a production ability greater than perennial, considerable investigation and selection work has been undertaken by the Grasslands Division of the Plant Research Bureau in the last few years. The outcome is an intermediate type of ryegrass to be known under the name of 'Short Rotation' ryegrass."

This ryegrass was designed primarily for the short-lived pastures of the arable lands of the South Island. However, use of this grass increased rapidly and it is now widely sown throughout the country, not only in the arable but in the dairying districts.

The introduction of short-rotation ryegrass marked an important step in pasture development in that it represented the first production of a valuable hybrid grass for New Zealand pastures.

Crop Diseases

CROP diseases plagued the farmer as much 50 years ago as they do today. This is confirmed by the many references to the subject, describing symptoms and suggesting suitable methods of control, in the "Journal's" early issues. Specific treatment has brought some of the diseases under control, for others preventive treatment has been the only practical approach, and with some it is still only possible to advocate what was recommended by A. H. Cockayne* in April 1912 (for black mould in wheat): adoption of crop rotations and proper farm hygiene.

OUTSTANDING in the control of diseases has been the reduction of cereal smuts to negligible proportions by appropriate seed treatment. As long ago as 1911 Cockayne referred in the "Journal" to the use of bluestone for the control of wheat smut. This and other seed steeps, though reasonably effective in the control of stinking smut of wheat, frequently had a disastrous effect on the germinating capacity of the seed (J. C. Neill, the "Journal", September 1923). Neill found that copper carbonate used in a dust form as a seed treatment similarly controlled smut without appreciable damage to the seed.

In the September 1924 "Journal" Neill pointed out that whereas stinking smut could be controlled by chemical solutions or dusts, a form of moist heat treatment was needed for loose smut. In the March 1925 issue he described a method of hot water treatment which gave full control of the loose smut with a loss in germination not exceeding 10 per cent.

The same author in the May 1925 "Journal" reported even more successful control of stinking smut with a number of seed treatments, including newly developed mercury preparations, with possibly a higher emergence than obtained from untreated seed.

Swede bulbs of the clubroot-resistant variety Wye (back row) and another variety having a little resistance (front row) grown on heavily clubroot-infested land. Development of a resistant variety appears to be the only means of overcoming this serious disease of New Zealand's most important winter fodder crop.

[Department of Scientific and Industrial Research

J. C. Neill, who developed seed treatments which resulted in the reduction of cereal smut infection to negligible proportions.

The successful application of hot water treatment to control oat and barley smuts also was recorded by Neill in the April and May issues of 1927.

Potato Diseases

As long ago as 1914 H. E. McGowan recorded the result of spraying a potato crop with bordeaux mixture for the control of late blight of potatoes. The treatment is still probably the best preventive of that disease and only its complicated preparation has led to its replacement by copper oxychloride preparations in spray and later in dust forms.

The so-called "running-out" of seed potato stocks was associated by J. W. Hadfield (the "Journal", July 1924) with some pathological condition of the plant. Hadfield and J. H. Claridge (now Chief Advisory Officer (Agronomy), Department of Agriculture), reporting on the first year's experience in seed potato certification in the "Journal" (July 1928) concluded that infection with virus diseases brought about a great reduction in yield. Procedures to minimise the effects of these diseases were described by Hadfield in the August 1928 "Journal". Such procedures associated with seed potato certification have been the only means of control of virus diseases to date.

Brassica Diseases

Clubroot and dry rot diseases of brassicas are two diseases which

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*Director-General, 1936-43.

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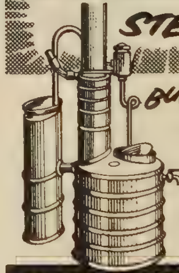

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* The Department of Agriculture exhibit will be staged at this show.

have for long defied the search for an effective control. Cockayne's advice in the September 1915 "Journal" was perhaps the soundest approach, both then and now. He suggested that soil contamination had been an important source of infection and recommended that stock feeding on diseased crops should not be transferred to areas which would be required for turnip or swede growing within at least a few years. Cockayne advocated heavy liming and the use of basic slag instead of acid artificial fertilisers. He also hinted at the possibility of varietal resistance to clubroot, a point which received confirmation from R. B. Tennent[*] (the "Journal", April 1925).

Of dry rot in root crops Cockayne recorded (the "Journal" August 1918) that the disease was much more serious in swedes than in turnips, that all varieties of swedes appeared to be equally affected, that deterioration was very rapid after about the third week in July, and that stored swedes appeared to keep much better than those left in the field. He advocated the study of farm management factors in an endeavour to do away with the necessity for swede growing in districts where dry rot was serious.

Very little progress seems to have been made since then. E. B. Levy[†] concluded (the "Journal", October 1919) that the better the crops in an affected area were, the more subject they were to the disease, and that a green top variety he had tested might have some little resistance to dry rot. In the November 1920 "Journal" the same author observed that primary infection in the crop "would certainly appear to be windborne spore infection".

Though G. H. Cunningham[‡] in the July 1927 issue claimed that the seed had been shown to be the prime carrier of dry rot disease, Neill later commented (the "Journal", August 1929) that seed treatment did not prevent the appearance of dry rot in the field. The search for a means of control still goes on, with emphasis on the possibility of developing disease-resistant strains.

Brown Heart of Swedes

Some control of brown (mottled) heart in swede bulbs was first obtained from the application of wood ashes in one section of a Fields Division trial (the "Journal", December 1927). Then in the August 1936 "Journal" the Department's Crop Experimentalist, J. W. Woodcock (now Director, Farm Advisory Division), reported more effective control from borax, and the addition of it became standard practice wherever the disease occurred.

Neill, R. M. Brien, and E. E. Chamberlain in the September 1934 "Journal" described "sore-shin" of blue lupins and identified the cause as a virus. Chamberlain later found that the same virus caused pea mosaic (the "Journal", August 1935). In the March 1937 issue he described the symptoms, economic significance, and preventive treatment of pea mosaic, stating that the virus overwintered on red clover plants and was spread to other susceptible hosts by migrating aphids. A list of susceptible and immune pea varieties was given by Chamberlain in the April 1940 issue.

A. M. Cruickshank in the February 1952 "Journal" described the field symptoms of pea wilt, a disease first recognised in New Zealand four years earlier. He recorded considerable variability in varietal susceptibility to this disease, and in the February 1957 issue he and D. E. Yen reported success in the incorporation of wilt resistance into a previously susceptible variety (Greenfeast).

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[*] Director-General, 1958.

[†] Director, Grasslands Division, 1936-51.

[‡] Then Micologist, Biological Laboratory; Director, Plant Diseases Division, 1936-57.

Encouragement of Farm Forestry

AN era during which severe inroads had been made into New Zealand's once vast indigenous forests preceded the establishment of the "Journal" in 1910. Since that date attention has had to be focused increasingly on the need to preserve existing timber stands and to encourage the planting of trees both to provide shelter for stock and crops and to supply fencing and building timber and firewood.

EARLY in its life the "Journal" attempted to stimulate a positive approach in farm forestry, and there would no doubt have been general agreement in principle among settlers of the time with this assessment in an article in the December 1913 issue:

> The benefit accruing to stock and crops from shelter must be fully apparent to every one acquainted with the rudiments of rural economy.
>
> Therefore, the rapid development of the dairying industry and stock raising in New Zealand makes it expedient that attention should be devoted to shelter plantations, the formation and proper distribution of which should have on the climate an influence beneficial to stock and crops.
>
> . . . a great deal can be done by private landowners to improve the aspect of the country by providing shelter for stock and producing timber suitable for fencing and other useful purposes.

Powerful confirmation of this estimate of the value of farm forestry was provided in the March 1914 issue in an article discussing the opinions and recommendations of a Royal Commission set up in 1913 to inquire into forestry conditions in New Zealand. However, what settlers were able to accomplish in tree planting was, as in so many aspects of land development, a compromise between what they knew to be desirable and what physical and financial conditions allowed them to attempt.

An important factor in the presentation of farm forestry information in the "Journal" has been the care taken to indicate the best tree species suitable for different districts.

Much private planting had been done in New Zealand 30 to 50 years before the "Journal" was first published, and the successes and failures of such plantings under a wide range of climates provided valuable information for writers on farm forestry. One result was that even in the comparatively early years of publication the "Journal" was able to list with reasonable assurance species suitable for various districts.

"Journal" advice on farm forestry has not finished with the supplying of lists of suitable species, but has included instructions for farmers wishing to raise their own tree stocks in nurseries, planting techniques, silvicultural treatment, thinning, and harvesting.

A variety of qualifications has distinguished the authors of articles on farm forestry in the "Journal". Some of the writers in early years were non-professional but very enthusiastic tree lovers, superintendents of plantation boards, and officers of the Department of Agriculture. In later years an extensive series of articles was by the Department's own Farm Forestry Officer, and more recently a comprehensive series has been written by an officer of the New Zealand Forest Service.

More prosperous times for farmers which followed the Second World War and concurrent shortages of once plentiful native timbers have combined to stimulate interest in the planting of trees for shelter and shade, for future timber supplies, and for beautification.

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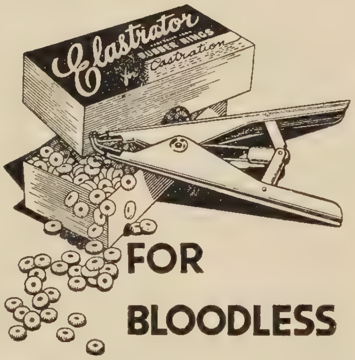

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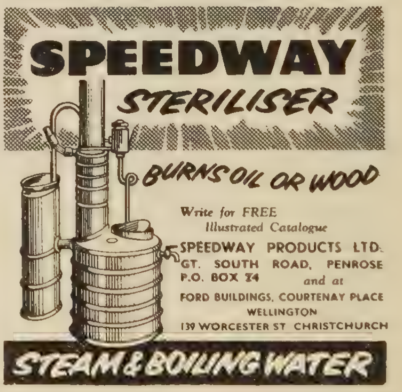

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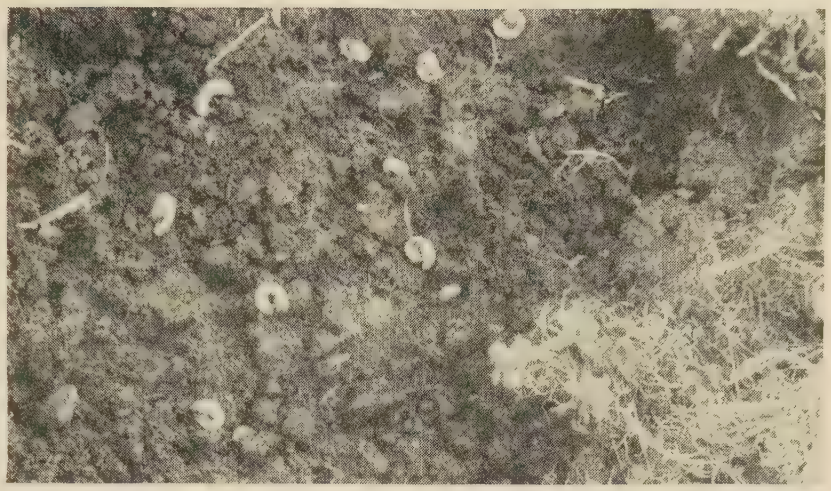
Insect Pests of Pastures and Crops

EARLY volumes of "The New Zealand Journal of Agriculture" show that there was acute appreciation in those days of the ravages in pastures due to insects which remain among our most serious grassland pests. Detailed articles on the subterranean grass caterpillar appeared in 1915 and on grass grub in 1920.



No satisfactory method of controlling grass grub, New Zealand's most serious pest of pastures, was known until the introduction of DDT about 10 years ago.

THOUGH a good deal was known and recorded of the occurrence and life histories of these pests, it was evident that they were a frustrating problem because there were no known means of effective economic control, as the Department's Biologist, A. H. Cockayne*, admitted in the "Journal":

April 1913: "There is really no practical means of dealing with the grass grub over extended pastures."

July 1915: ". . . a practical method of control (of subterranean grass caterpillar) on a large scale is lacking."

July 1920: ". . . on farm land there is no practical method of destroying the pest [grass grub] by trapping, poisoning, burning, or by soil fumigation and chemical treatment."

As late as January 1945 D. Miller wrote: "The grass grub is the major insect pest of the country, striking as it does at the pastures of the Dominion upon which our prosperity depends, and no really effective control of the problem. . . is known."

Chemical treatment, such as with carbon bisulphide, was successful but far too expensive for anything but small areas.

In the absence of practical chemical or other treatments, authors could only advise, as did Cockayne in the "Journal" in July 1920, that: "With our present knowledge, all that one can do is to avoid practices that encourage rather than restrain the development of the beetles." R. P. Connell recommended some management practices to counteract damage, such as feeding out of hay, roots, and other fodder on infested areas and topdressing to encourage pasture vigour (the "Journal", June 1933).

Miller in 1924 showed that the extent of grass grub damage was greater than previously recognised, because the so-called turnip fly was in fact the grass grub beetle.

Not until after the Second World War did effective and economic insecticides (DDT and BHC) become available. One of the first articles on experience with DDT on grass grub to appear in the "Journal" was by E. M. Bates, who wrote in May 1949 of spraying experiments in South Taranaki, describing good kills of adult beetles during the main flights in early summer.

The modern technique of grass grub and grass caterpillar control in pastures was foreshadowed in an article in the August and September 1951 issues by J. M. Kelsey, who recorded: "Experiments over the past three years. . . by the Entomological Research Station have shown that some of the newer chemicals such as BHC, DDT, rothane (DDD), and chlordane . . . [have secured] sufficiently conclusive results to justify mention of them." From this work has emerged the now general recommendation for the use of DDT in the control of grass grub and subterranean grass caterpillar in New Zealand pastures.

Other Pests

The "Journal" has contained many articles on pasture and crop insect pests other than those mentioned. E. Clifton, once Director of the Fields Division and at the time New Zealand Commissioner in San Francisco, in the March 1916 issue, described methods used in Imperial Valley, California, to combat the black cricket. This insect seemed to him similar to a cricket which caused extensive pasture damage in New Zealand, and he gave a recipe for a bait consisting of bran, Paris green (arsenic), molasses, and water which was adopted for use in New Zealand against crickets. A similar bait was prescribed by J. Muggeridge (the "Journal", April 1934) for use against army caterpillars.

This means of control was used for many years against crickets and army caterpillar before it was superseded by the modern insecticides such as DDT and BHC.

White Butterfly

About 1930 the white butterfly (*Pieris rapae*) was introduced into New Zealand and rapidly became a pest of epidemic proportions in brassica crops. It was successfully combated by biological methods of control. Articles published by Muggeridge between 1931 and 1935 record in sequence the introduction, establishment, and ultimate success of a parasite (*Pteromalus puparum*), which reduced its white butterfly host to a relatively minor pest.

The diamond-backed moth, a pest of brassica crops still remains a formidable enemy, though it has been controlled to some extent by the introduction of parasites mentioned by J. Muggeridge and B. B. Given in the "Journal" for November 1941.

New Zealand was well served by the entomologists who contributed to the "Journal". In the earlier days their efforts on behalf of agriculture were sometimes frustrated because the means of control they knew to be necessary were not to become available for many years; but the practical information and knowledge they contributed were of great value and were the foundation on which their successors based techniques of insect pest control.

---

* Director-General of Agriculture, 1936-43.

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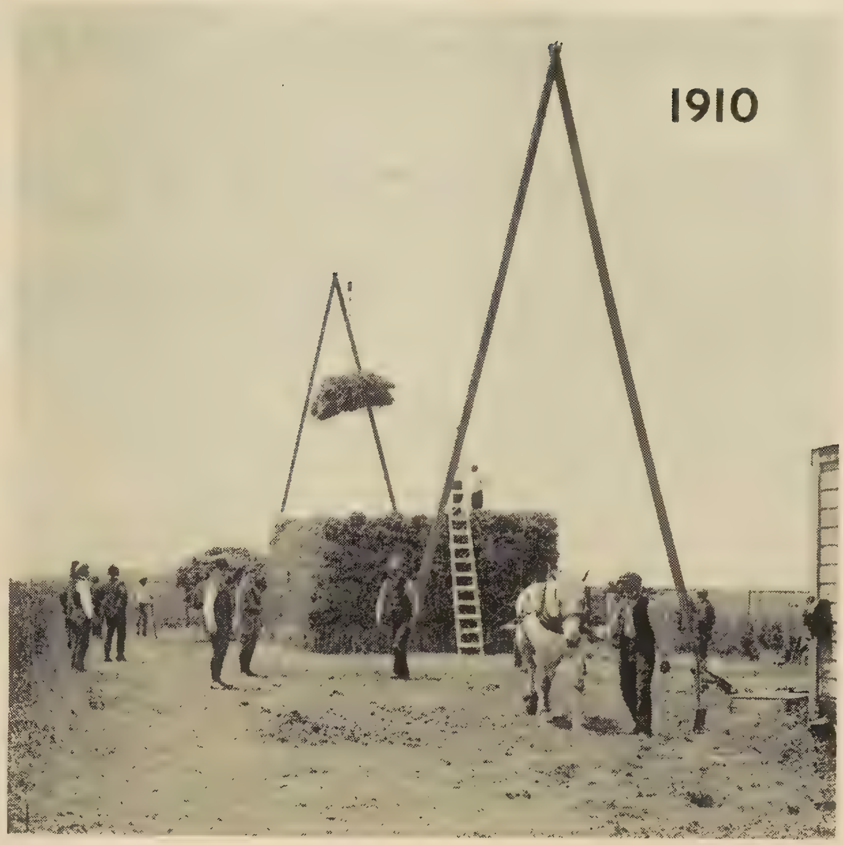
Silage

"IN New Zealand ensilage is already recognised as a valuable addition to the resources of the farm," wrote E. Clifton in the first issue of the "Journal". He discussed in the article the making of stack ensilage and pointed out that the making of silage from surplus grass was a good method of eliminating roughage which could not be or had not been made into hay. Crops which he mentioned as suitable for ensiling were oats, Italian ryegrass, tares, peas, sorghums, millets, and, "most useful of all", maize. That the Department was anxious to publicise and encourage the use of silage is evident from a report in the January 1912 issue, in which W. Dibble is referred to as "Instructor in Ensilage to the Department".

FROM articles appearing in the early issues of the "Journal" it is apparent that the value of silage was not accepted widely. This undoubtedly led Dibble to suggest (the "Journal", May 1913) that as properly made silage had proved a suitable feed in other countries it was: ". . . surely reasonable to suppose that silage will prove equally valuable in New Zealand . . ."

At that time the emphasis was on the need for supplementing summer and winter feed, and for this purpose the growing of special crops for ensiling was emphasised rather than the use of surplus spring grass. In the same article Dibble wrote: "Such ideal succulent and nutritious materials for silage as maize and peas, oats and tares, or lucerne are certainly more desirable for stock feeding than dry hay, in which little nourishment often remains."

The extent to which mechanisation has facilitated the making of silage is strikingly illustrated by the comparison of methods in vogue when the "Journal" began publication and 50 years later.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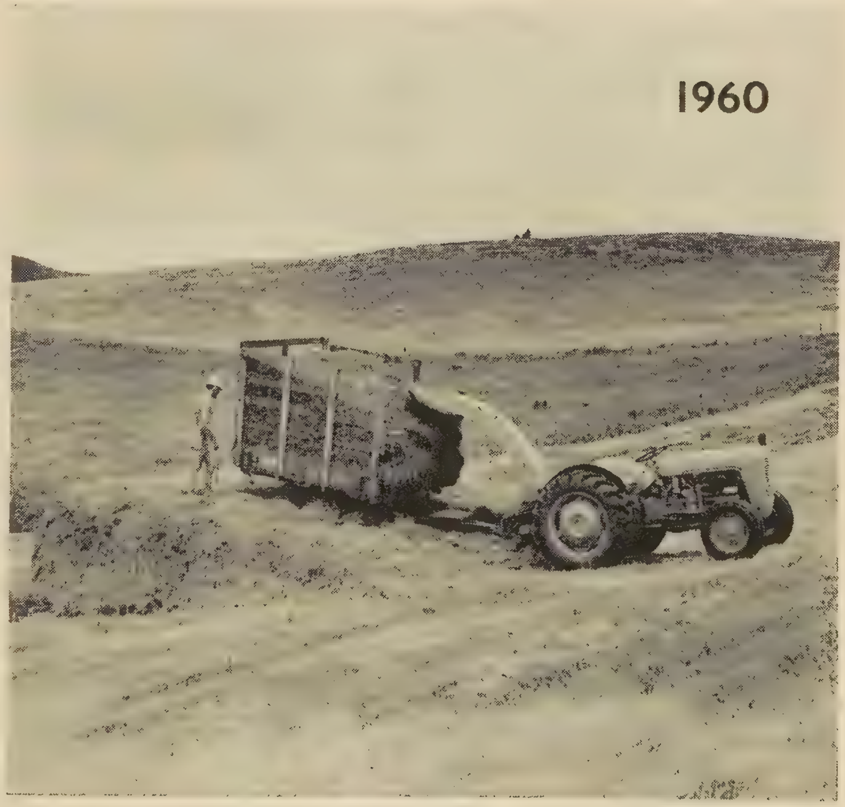
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At various times publicity was given to the methods of constructing silos, the most popular of which were the circular ones of concrete. It was, however, generally conceded that the rectangular stack was the most suitable method of ensiling because of the lower cost.

By the late 1920s the value of silage was being much more widely accepted, owing to a considerable extent to the publicity which it had been given, particularly in Taranaki by J. W. Deem. An article, "Ensilage on the Farm", he contributed to the September 1929 "Journal", was reprinted as a bulletin and was for a number of years the most authoritative written material on the subject.

By this time silage made from pasture was being considered as a replacement for crops and as a way of using surplus growth. Deem made an important point when he said:

> The making of ensilage is one of the greatest helps in grassland management and, by providing sure and economic means for the removal of surplus grass, it enables the farmer to keep his pastures in a fresh green condition.

This statement and the increased interest in silage coincided with a rapid increase in the use of phosphatic fertilisers. Better pastures resulted in better growth in spring, and these surpluses could be used to advantage by converting them into silage.

During the depression of the early 1930s and the Second World War, when the use of phosphatic fertilisers declined, the amount of silage saved also fell.

Since farmers have been able to apply adequate fertiliser pasture production has increased greatly and a very large area has been saved for silage. Mechanisation has made cutting, carting, and stacking much easier. Most silage is now put into clamps (long, low stacks) on to which the tractors can carry and dump the green material, though pits are also widely used. Feeding out of the heavy material remains laborious, though this problem is being overcome by the development of various systems of self-feeding.

Irrigation

IRRIGATION was referred to in the first issue of the "Journal" by A. Macpherson, designated "Fields Instructor for the South Island", in a report on the depleted country of the Mackenzie Plain. He wrote: "I am of the opinion that there is a great future before this part of the country, and that extensive areas of the plain now lying almost waste can be ploughed and brought to produce both good grass and root crops. At present it is a treeless, shelterless plain . . . The natural water supplies at present running to waste through and past the plain can be utilised with little difficulty and no great cost for irrigating the parched soil."

THE development of irrigation and some of its technical aspects were covered in a paper by F. W. Furkett, a Public Works Department engineer (later Engineer-in-Chief), which was reprinted in the "Journal" in June 1917. Up to that time two Government irrigation schemes in North Otago had been completed and two (Ida Valley and Manuherikia), in Central Otago, were under construction.

In the 1920s R. B. Tennent, Instructor in Agriculture at Dunedin (Director-General 1958), identified himself with irrigation in Central Otago, and, with J. R. Marks, Resident Engineer of the Public Works Department at Alexandra, published in December 1921 some details of the experimental

[*Sparrow*

The main irrigation channel between the Rangitata and Rakaia Rivers. (Mt Somers district, Mid Canterbury.)

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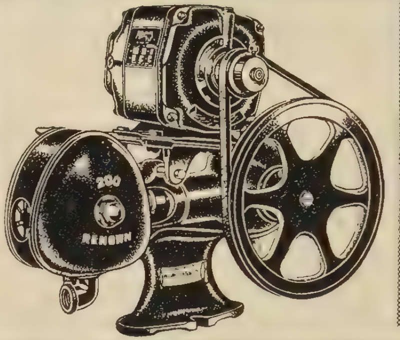

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and demonstration work to be carried out on an area of 148 acres taken over that year by the Department of Agriculture at Galloway, some three miles from Alexandra. They set out the results obtained up to that time by the border method of irrigation and costs of preparing the land.

Some details of the Government irrigation schemes then in operation and under construction in Central Otago were given by the same authors in the "Journal" in March, April, and June 1924. They indicated the type of farming for which irrigated areas might be suitable; for instance, that the area covered by the Ida Valley scheme was admirable for dairy farming and the raising of beef or mutton. They considered mixed farming and especially lucerne growing presented great possibilities.

Methods of establishing and managing irrigated pastures were dealt with by Tennent and Marks in the February 1925 "Journal".

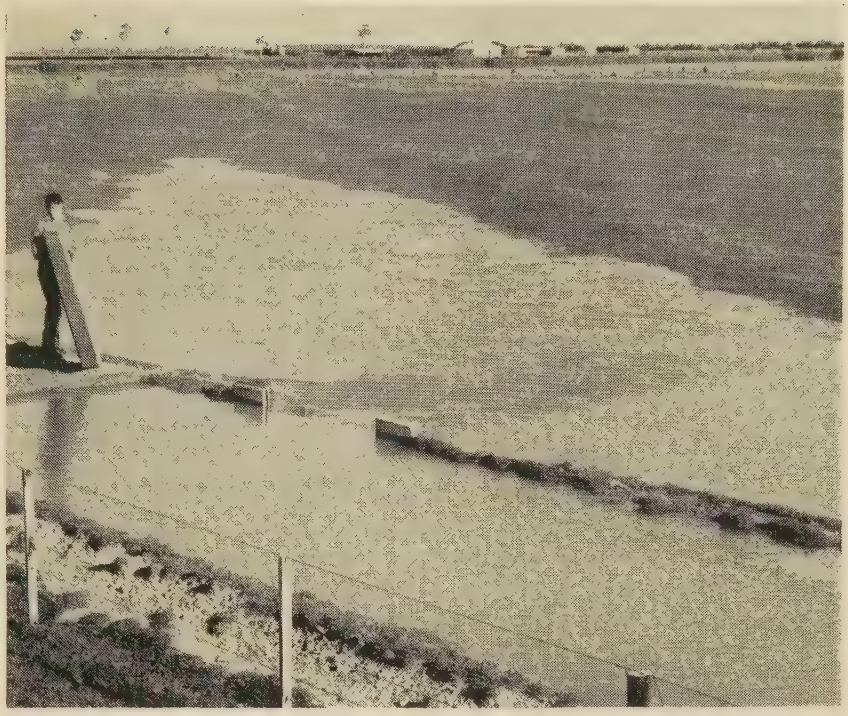
Reports on the Galloway Irrigation Farm appeared from time to time and by March 1929 Tennent was able to review some progress. In 1924-25, when dairying was begun, 13 milking cows and 12 heifers were run; by 1928-29 the number of milking cows had reached 56 with 14 heifers and 14 calves. Butterfat production per acre was 137 lb in 1928-29.

Work in Canterbury

The first reference to irrigation in Canterbury was made in the April 1934 "Journal", in which F. W. Hilgendorf reviewed experiments carried out by R. L. James, Lecturer in Engineering at Canterbury College. The most comprehensive experiment was that at Seafield in cooperation with the Lands and Survey Department. Here both border dike and border ditch methods were used. The Department of Agriculture took no part in these trials, and in fact there is the impression that it was rather tardy in associating itself with the early work on irrigation in Canterbury.

However, in 1938 officers in Canterbury began to show interest, and for most of that year a monthly section on irrigation was published in the "Journal" covering such matters as producing new pastures for irrigation, response of clovers under irrigation, and storage dams for irrigation. There followed in March 1939 a profusely illustrated article by Tennent (then Director, Fields Division) showing the most expeditious and economical methods of spreading water.

A. A. Copland in June of the same year gave information on the methods of establishing and managing pastures under irrigation, this information being mainly for farmers served by the two new State irrigation schemes in South Canterbury — Redcliffs and Levels.



Irrigation in progress at the Winchmore Irrigation Research Station, centre for investigation of flood irrigation problems.

In July 1941 A. G. Elliott, Crop Experimentalist, gave some results of trials with wheat under irrigation. These indicated that the average increase in yield over non-irrigated wheat was 8.6 bushels per acre.

The year 1937 had marked a turning point in irrigation, for in that year the Department of Agriculture and the Public Works Department began some large-scale trials on a farm at Winchmore. Results became available for publication in the March 1945 "Journal". One of the main features of these trials was a carrying capacity of 6 sheep per acre on irrigated areas compared with 1 sheep per acre on non-irrigated.

With the beginning of the first major flood system of irrigation in Canterbury (the Ashburton-Lyndhurst scheme) in 1946 it became necessary to investigate all aspects of flood irrigation. To do this the Department of Agriculture in 1947 bought land in about the centre of the scheme and established Winchmore Irrigation Research Station.

From 1952 the "Journal" frequently gave results from experiments at the Station.

G. K. McPherson, Superintendent of Winchmore, stated in an article in March 1952 that on the Station's 150-acre dairy unit 66 cows were milked in the 1951-52 season and the production of butterfat had reached 18,538 lb or nearly 124 lb per acre. Under dry farming this area carried about 1 ewe per acre. By January 1953 the carrying capacity for sheep had increased from ¾-1½ ewes per acre to 3 ewes per acre and between the 1947-48 and 1953-54 seasons wool production per acre had increased from 13.5 lb per acre to 39.1 lb per acre (the "Journal", January 1953). Computation of times occupied on irrigation indicated that 0.9 acre of crops could be irrigated per hour and 1.8 acres of pasture per hour.

Research results from the Station have continued to provide most of the information on irrigation which has appeared in the "Journal".

Overhead Irrigation

Sprinkler or overhead irrigation was first discussed in the "Journal" in June 1950, when interim results from trials at Rukuhia Soil Research Station were discussed. Investigations at Rukuhia continued and were reviewed in February 1958 by H. G. Hopewell. He was able to make some recommendations on sward species and fertiliser requirements, management of pastures, timing of irrigations, and quantity of water to apply.

Hopewell recorded that by 1958 about 600 to 700 overhead spray plants were being operated by farmers in the North Island.

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In 1900 gorse was declared a noxious weed in the second schedule of the Noxious Weeds Act.

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By G. R. MOSS,
Farm Advisory Officer,
Department of Agriculture,
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THE history books fail to tell us when gorse was first introduced into New Zealand. It must have come in early, because when Charles Darwin visited the Bay of Islands in 1835 he recorded gorse hedges growing at Waimate.

Gorse was in great demand in the early days both for fodder and for hedge plants. Importers were bringing in the seed from England for sale to the public and to nurseries. In the Wanganui district, where gorse is one of the problem weeds today, nurseries were established in the 1860s at Waitotara and at a mission at Aramoho.

Gorse hedges played a very important part in the development of Canterbury and some credit must be given to this weed, as undoubtedly it had a place under intensive farming conditions. Unfortunately, most of the farming in other parts of New Zealand was extensive. Our ideal climate for the growth of legumes, the understocking of our farm lands, and the lack of competition from pasture species all played their part in the spread of gorse. In its new environment gorse flowered prolifically and set seed longer than it did in Europe. Far more seeds were produced for dispersal and, with more effective agents for spreading these seeds, it is little wonder that it invaded farm lands and took control of thousands of acres of hill country.

How Gorse Spreads

Gorse is spread mainly by seeds, which are spread primarily by ejection from the pod, but birds, animals, man, wind, and water all play their part.

In the past we have underestimated the distance the drying pod can throw the seed from the bush. Writers in Europe, North America, and Australia mention 2 to 4 ft as the maximum distances seeds are thrown from the pod, but in New Zealand travel of seeds has been measured at 16 ft and there is evidence to suggest that some travel even greater distances.

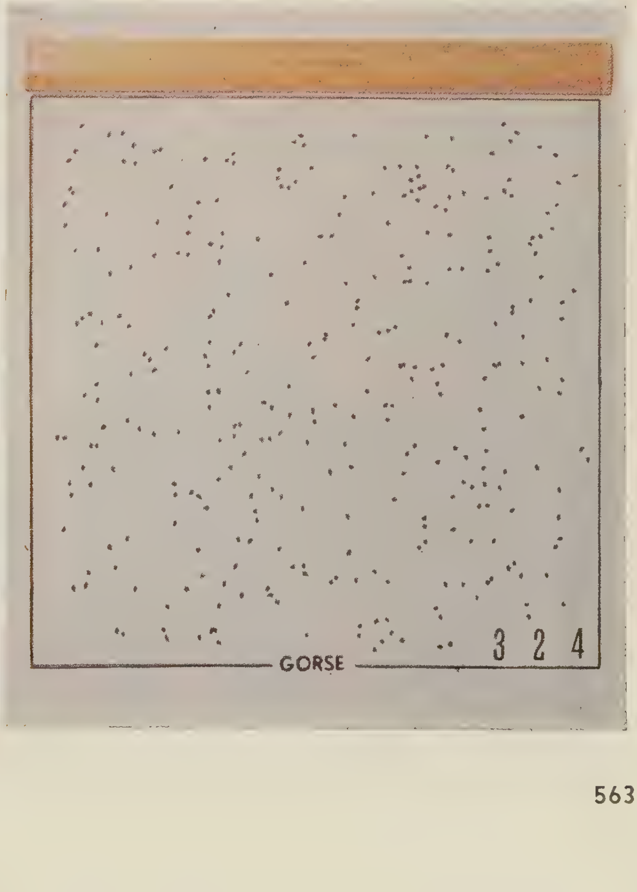
Though birds are not particularly fond of gorse seeds, feeding trials have shown that they do eat them. The hard coats of the seeds would suggest that they could pass through a bird undamaged and birds could therefore play some part in the spread of this weed, but it is hard to assess the importance of birds as dispersal agents. The main feeding period on gorse seeds is during winter, when there is a seeding which coincides with a natural shortage of food. At this time of the year birds eat the seeds from under the bushes, where they accumulate.

Animals carry seeds in their coats and in the mud attached to their hooves. Numerous gorse seeds were found in the wool of sheep examined after they had been in a paddock containing gorse bushes.

Man spreads seeds in the mud on his boots or in the soil sticking to his farm vehicles and implements. The potential danger from this source was clearly illustrated when soil samples were taken from one area being cleared of gorse. Five hundred plugs were taken from the paddock and the gorse seeds were extracted and germinated. It was calculated that in the

← Gorse flowers and sets seeds prolifically. The seeds are spread mainly by ejection from the pod, but birds, animals, man, wind, and water all play their part.

↓ One paddock had a gorse seed population of 324 seeds per square foot in the top 2 in. of soil, or over 14,000,000 seeds per acre.



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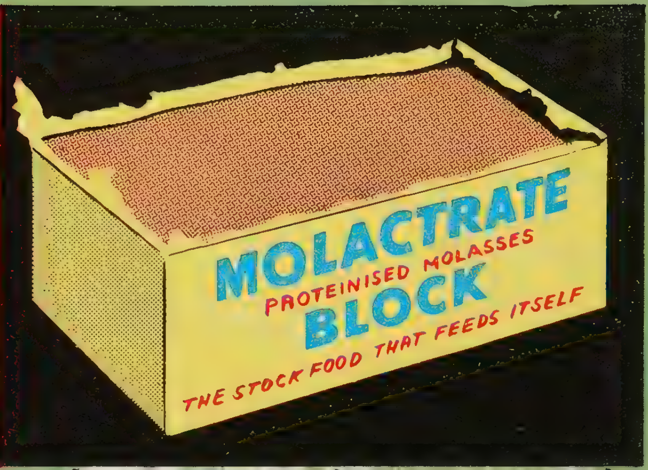
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top 2 in. of soil there were over 14,000,000 gorse seeds per acre capable of germinating.

Normally, wind is not an important agent in gorse seed dispersal, but hot, drying winds, such as Canterbury norwesters, do assist the explosive ejection of the seeds.

An interesting fact is that gorse seeds are actually becoming airborne due to man's interference. A farmer in the Marton district reported finding valves (half pods) with one or more seeds still attached at a considerable distance from a gorse hedge. Investigation revealed a number of valves with seeds firmly attached by cocoon debris left by the gorse seed weevil. Several valves with seeds attached were tossed into the air and were carried some distance by a strong breeze. The gorse seed weevil does not necessarily eat all the seeds in a pod and partly eaten seeds will germinate if the embryo is undamaged.

Water has always been considered an important agent in the spread of gorse seeds. The seeds are heavy and when thoroughly wet sink to the bottom in still water, but in fast flowing streams and rivers in flood the seeds, unopened pods, and small dry branches may be carried considerable distances. The range is extended still further when gravel taken from gorse-infested river beds is used for road construction and other purposes.

Because gorse seeds can be ejected up to 16 ft, gorse should be kept well clear of boundary fences.

Gorse Seed Weevil

The gorse seed weevil (*Apion ulicis*) was first released in New Zealand in 1931 to check the spread of gorse by destroying the developing seed. The female weevil lays her eggs in the seed chamber of the pod, and when the grubs hatch they devour the seeds. The grubs pupate and adult weevils emerge, so that when the pods burst open weevils are scattered instead of seeds.

How Effective is the Weevil?

Early counts of pods containing weevil were most promising, but recent local investigations have been disappointing. Near Wanganui 37 gorse areas were examined during 1957 and 1958. From this examination it was estimated that only 20 to 40 per cent of the seeds produced during the summer seeding were destroyed by the weevil. In January 1959 Miss B. D. Matthews, Scientific Officer, found that of over 1,200 pods collected in the Manawatu 41 per cent contained weevils.

Winter observation on areas with a dense summer weevil population failed to show any change in the life cycle of the weevil. Weevils are active only during the summer seeding period. During the winter seeding they remain dormant, and can be seen at the bases of the spines, where they resemble minute greyish buds.

Sprays of 2,4,5-T have no effect on the weevil apart from taking away the source of food. Both sprayed and unsprayed gorse contains weevils. In districts where burning is a regular practice few weevils are found. It appears that after a fire it takes some time for an effective population to build up again, especially in an isolated area.

Local observations indicate that the weevil has not lived up to expectations. Credit must, however, be given to it as an effective means of slowing down the spread of gorse.

Buried Seed Problem

In some localities there are large populations of hard seeds of gorse in the soil and they can remain in this condition for a long time. This seed dormancy is of advantage to the plant because seedlings can emerge for many years even if further production of seed is prevented; for the farmer it is a distinct disadvantage. Numerous cases have been recorded where cultivated land has been ploughed out of gorse and kept free for many years, only to come back into gorse after reploughing.

Buried seeds are no problem if the pasture is thick and stock are sufficient to keep the gorse seedlings down. In practice on steep hill country it is almost impossible to maintain such conditions owing to weather, soil type, pugging, slips, and the high cost of fencing. The gorse seed population under pasture on this class of country and the longevity of this seed, are of vital economic importance to the farmer because of the recurring cost of spraying such areas.

Viability of Seed

The length of life of a gorse seed depends on the condition of the seed at maturity and on the conditions in the soil. To get an indication of how long seeds can remain in the soil and still germinate 11 paddocks were sampled. These paddocks had varying histories—some had been out of grass for a short period, others for up to 30 years. Gorse seeds were extracted from 3,600 soil plugs and tested to see if they would germinate. This investigation showed that if a cleared area is not reseeded, some of the gorse seeds could survive in the soil for up to 26 years and still germinate. Only the first 10 years are the problem regrowth years and the seriousness of the regrowth depends on the thickness of the pasture sward and the grazing management. Heavy grazing under very dry or wet conditions tends to open up the pasture and permit the gorse seedlings to come away.

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▲ Burning is essential for gorse control on unploughable hill country.

After a hot fire the area is bare enough to be reseeded with good strains → of grasses.

Principles of Gorse Control

Differences in topography and climate make it difficult to generalise on methods of clearing gorse, but certain principles apply to all areas. On country that cannot be worked by machinery burning is essential as the first step. This is best carried out in early autumn while the gorse is in full flower. Generally a hot fire is possible without prior treatment, but in damp, shady places it may be necessary to cut or to spray before burning. Often a hot fire can be obtained by closing an area up from stock early and allowing the grass to become rank so that it can carry a good fire later.

A hot, slow burn can be obtained if the burn is against the wind. This will permit many of the seeds lying in the soil to germinate rapidly and so reduce the potential seed menace in the soil. One paddock under observation was subdivided and half was burnt. When the areas were sampled a year later the burnt area had less than half the seed population of the unburnt area.

Once the mass of seedlings germinates the cheapest method of control is with stock. To be used efficiently stock must be concentrated. Therefore it is essential to subdivide the burnt area into suitable grazing blocks and to oversow with fast growing grasses and clovers to give the stock something to fossick for. This is the only opportunity to get good strains of grasses on to hills at a reasonable cost. While the stock are grazing the seedlings they are increasing the fertility, consolidating the soil, and bringing in a cash return to help balance costs.

As stock management is critical at this early stage in controlling seedling growth, it is essential to clear areas which are not too big to be managed efficiently. If burning, subdivision, and stocking have all been adequate, spot applications of 2,4,5-T should be all that is necessary. If these requirements have not been fully met, it may be necessary to blanket spray the area with 2,4,5-T. To control seedling and regrowth gorse, 2 lb of acid equivalent per acre is sufficient, but rates up to 4 lb are necessary for older gorse.

As in all weed control it is essential to establish a vigorous pasture as soon as possible with the aid of oversowing and adequate topdressing. As 2,4,5-T will kill clovers, it will be necessary to oversow with clovers as soon as conditions are suitable to replace losses.

Common Mistakes in Clearing Gorse

Many farmers who lack experience in clearing gorse believe that gorse can be cleared from a steep hill face by an aerial spraying. Spraying is only one factor in clearing gorse. Budgeting for the control of gorse must include adequate fencing, oversowing, topdressing, and increased stock numbers.

Often farmers aerial spray blocks that would take a fire without a spray. The money saved from this initial spray would be better spent in many cases in spraying later in development.

The commonest mistake in clearing large blocks of gorse is to try to do too much at a time. Money spent on spraying, seed, and fertiliser is frequently wasted through lack of adequate subdivision into manageable areas. Sunny places should be fenced off from shady places; hillsides should be fenced off from flat areas. If finance is short, only blocks of gorse that can be managed efficiently with the available finance should be cleared. Often temporary subdivision can be made, electric fences being used to control sheep or cattle.

Can We Get Rid of Gorse?

Very few farmers associate the gorse on the back of the farm in a waste area with a hedge several miles away, and yet the wool on a sheep will carry the seed without any trouble. There would be no gorse problem in New Zealand today if we had not planted gorse hedges. We can never hope to get rid of gorse as a weed until every gorse hedge has been destroyed. Gorse hedges, unless trimmed annually, shed seeds over two long periods during the year. In most cases these seeds fall on to a tight pasture sward, and gorse seedlings are no problem near the hedge. They do become a problem, however, when they are spread around the farm by such agencies as stock, man, wind, birds, and water.

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LAND IMPROVEMENT

Development of Scrub Land

WITH the end in sight, by 1910, of the bush burn era attention was concentrated to a greater degree than earlier on two areas in the North Island that presented singularly intractable problems to anyone interested in their development. The open scrub-covered country in the upper Waikato area had interested both settlers and speculators from the 1870s onward and much of the fringe was taken up by large land companies with the object of developing the country and then subdividing it on profitable terms. All these attempts ended in failure, the prevalence of bush sickness (to be dealt with in "Conquest of Bush Sickness", which will appear in the July issue) and the difficulty in establishing reasonable pastures making it impossible for farming to be established on a profitable basis.

From the late 1890s the Lands Department began establishing exotic plantations in the Rotorua area and after the First World War the success of earlier plantings led to a boom in forest development, large blocks being established both by the State and private companies.

THE gumlands of North Auckland presented an even less attractive aspect. These areas were covered in low scrub and much of them had been turned over at some stage by kauri gum diggers; the limited fertility of this land was apparent to all. On some of the better gumland soils pastures consisting of low fertility demanding grasses had been established, but most of the land was almost entirely unproductive, providing only some rough grazing for a few beef cattle.

GUMLAND DEVELOPMENT

The first experimental work on gumland soils was described in the February 1912 "Journal" by J. Duncan, Assistant Director, Fields and Experimental Farms Division. He mentioned that trial plots had been laid down in the Kaitaia and Whangarei districts, the plots being sown with lower fertility demanding grasses and with clovers. He also mentioned a further series of trials to be laid out at Otaika, seven miles from Whangarei, this area later being named Puwera.

Nothing further appeared in the "Journal" until December 1917, when work in progress at Puwera was briefly described. It was claimed that the grass plots laid down in 1912 were more or less successful.

In March 1919 reference was made to trials with fodder crops and it was claimed that the trials with oats and clover were showing promise. The land used for them had been given a dressing of 1 ton of lime to the acre before sowing.

Bigger plans were under way, however, and in May 1921 T. H. Patterson, Instructor in Agriculture, and W. Dibble, Fields Instructor, Auckland, gave an account of the initial plans to develop the land to a stage where it would be suitable for dairy farming. The progress of this work was fully recorded in the "Journal" over the next 10 years, a major step forward being the availability from the mid 1920s onward of higher quality strains of ryegrass.

By 1925 about 50 acres at Puwera were reported to be in good pasture and in the November 1925 "Journal" Patterson reported that a small dairy herd of nine heifers and five cows had been established. Before this the property was grazed most of the time by dry stock, though dairy cows had been run on it for short periods. This article claimed that six years' work had shown that it was possible to establish useful pastures and to grow fodder crops successfully to provide supplementary feed.

Patterson stated that the land could be developed to the stage where it could carry dairy cows for £15 to £20 an acre, but he also pointed out that for an individual farmer to break in

First ploughing of a field at the Puwera experimental area after cutting and burning of manuka. (The "Journal", May 1921.)

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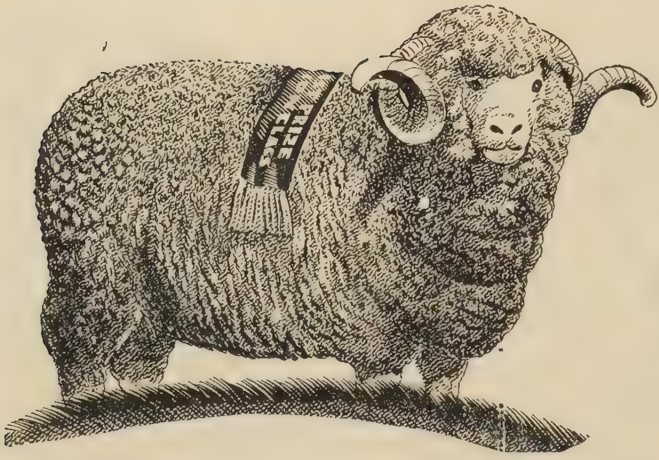

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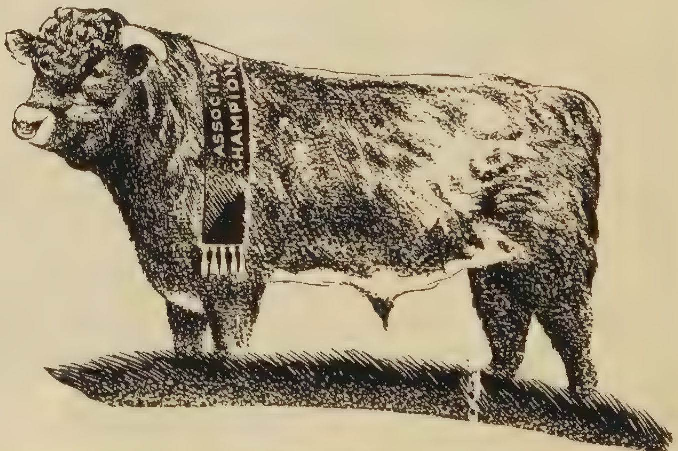

▲ Undeveloped gumland.

▼ Developed gumland.

an area sufficient to establish an economic sized dairy herd, a capital outlay of £1,500 to £2,000 would be needed. He added: "Obviously, therefore, it would be more a matter for the State or for private enterprise on a considerable scale to bring the land into profit, when settlers could take it up and make a living off it."

For the 1926-27 season and two subsequent seasons about 40 cows were milked, the inadequacy of the water supply, a serious problem on gumland, limiting the rate of expansion. For the 1930-31 season, when the water supply had been improved, some 53 cows were milked. In 1931 the property was handed over to the Lands Department for disposal.

The most important lessons learnt at Puwera were:

- The need for thorough and timely cultivation to prepare a seedbed.
- The value of drainage.
- The need for adequate liming and topdressing.
- The value of truly perennial strains of ryegrass.

The Puwera trial was of considerable importance in the development of gumland soils in Northland because of the role it played as a demonstration area. About 1930 experimental work also began on the Northland ironstone soils, and the subsequent large scale development schemes in the area have been able to make use of the techniques developed at Puwera.

In the July 1945 "Journal" P. W. Smallfield surveyed the prospects of land development in New Zealand and of gumland development wrote:

> The first stage in gumland development is filling in holes and draining wet patches with manuka fascine drains. The land is then ploughed with a short-breasted single-furrow plough, allowed to weather, then harrowed and reploughed. The first ploughing is done in the autumn and winter and the second ploughing in the spring. After the second ploughing the land is worked over the summer and sown in February.

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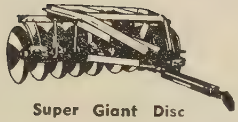
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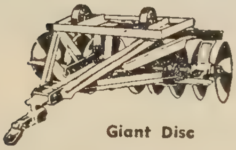
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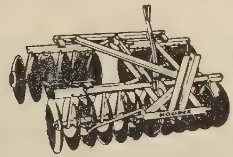
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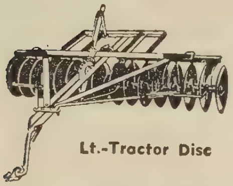
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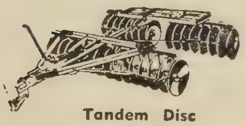
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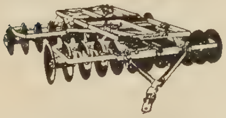
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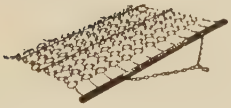
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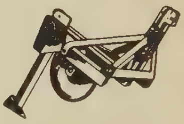
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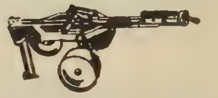
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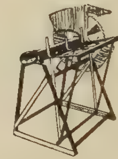
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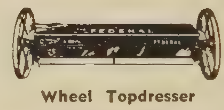
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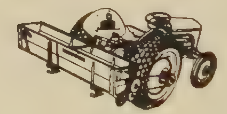
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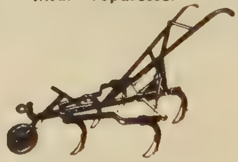
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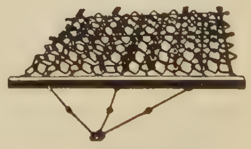
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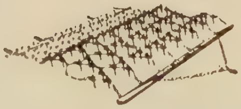
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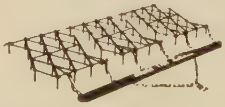
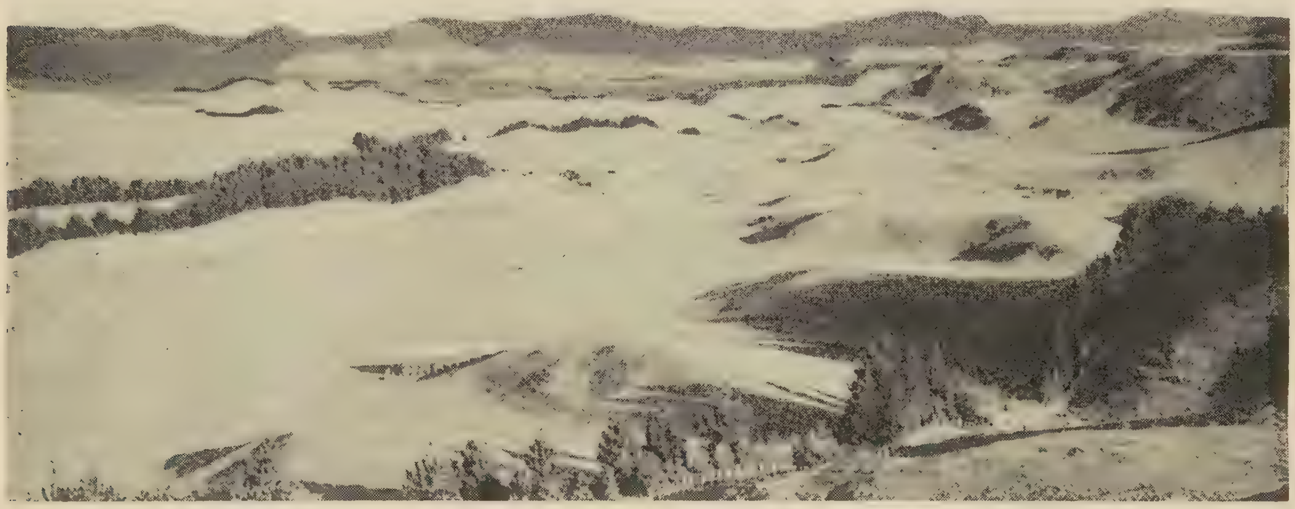

Tine Harrow

H9-1X

▲ Undeveloped pumice land.

▼ Developed pumice land.



The usual grass mixture for gumland consists of 25 lb of certified perennial ryegrass, from 5 lb to 8 lb of paspalum, 3 lb of crested dogstail, 2 lb of red clover and 2 lb of white clover and 1 lb of *Lotus major*—from 38 lb to 41 lb per acre . . . Most gumland should receive 1 ton of ground limestone before sowing and the seed should be sown with 3 cwt of superphosphate or basic slag and again topdressed with 3 cwt to 4 cwt of phosphates four or five months after sowing.

PUMICE LAND DEVELOPMENT

In the 1920s there was strong controversy between the supporters of forest and farm development in the pumice country. Some progress in bringing land into production was made round Putaruru and Tokoroa, and the future of the whole area was also discussed in relation to the possibility of the Government taking over the Taupo Totara Timber Company's railway and extending it to Taupo. The supporters of the railway being extended from Rotorua opposed this move strongly. Arising in part from this particular controversy a Parliamentary committee in 1929 examined the future of the area, including its agricultural potentialities.

Among other things this committee recommended that the Government undertake the development of several thousand acres; very soon after (in November 1929) the Land Laws Amendment Act 1929 was passed. This authorised the expenditure of public money on the development of Crown land, and early in 1930 the Department of Agriculture began the development of the Ngakuru block near Rotorua.

Successful Grassing Technique

The progress of this work and the problems associated with the development of pumice country were outlined in an article in the December 1933 "Journal" by P. W. Smallfield, who from the work carried out at Ngakuru had established the principles for successful grassing of pumice country. He emphasised the need for careful cultivation, the use of perennial strains of ryegrass, and generous applications of superphosphate—3 cwt per acre with the seed, a further 3 cwt a few months later, and another application within a year.

At the time this work was undertaken labour costs were fairly low; the estimates of the costs of establishing pastures listed in the article were about £8 per acre, including those for cultivation, seeds, and fertiliser. The cost of developing a property including buildings, fencing, and water supplies was nearly £19 per acre.

With the passing of the Small Farms Amendment Act 1933, land development work was largely taken over by the Department of Lands and Survey

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P. W. Smallfield recorded in an article on pumice land development in the May 1954 "Journal" that "On the Kaingaroa Plains there is a greater concentration of wood growth than on any other similar area in the world".

with the result that "Journal" references became fewer.

An appraisal of the progress made in the Rotorua-Taupo area was made in the April 1945 "Journal" by C. R. Taylor, Fields Instructor, Rotorua. He drew attention to the expansion of dairy cow and breeding ewe numbers and emphasised what a difference the correction of cobalt deficiency had made.

P. W. Smallfield's July 1945 article on land development (see page 571) outlined problems in grassing and in farming pumice country. He wrote: "Pumice land development was greatly assisted from 1929 onwards by three things: the availability of perennial strains of ryegrass through the Department of Agriculture's certification scheme; the cure of bush sickness, first by limonite licks and later by cobalt; and the large-scale development schemes of the State. Given good cultivation, a satisfactory seeds mixture, and adequate phosphatic topdressing, quite good permanent pastures suitable for dairying can be established on pumice land. Every operation must be thorough or failure may occur." He also mentioned the dangers of inadequately controlled red clover growth in the early stages and the value of swedes as winter feed when the dominance of red clover made difficult the saving of hay of satisfactory quality.

The October 1946 issue contained an article by A. T. Shannon, Field Economist, Hamilton, and Eva Topping, Rural Sociologist, Auckland, who described the fortunes of two brothers who took up a block of undeveloped land in the Ngakuru district in 1930. By 1945 they had progressed from the stage of having a house cow foraging in the scrub to milking 80 cows.

P. W. Smallfield again reviewed the history of pumice land development in the "Journal" in May 1954. He referred to the difficulties that had to be surmounted in establishing good pastures, mentioned the controversies of the 1920s on the use of pumice land, and concluded by pointing out that the pumice country today formed one of the most productive regions in New Zealand with large areas developed for farming by the Departments of Lands and Survey and Maori Affairs, the exotic forests with the large industrial plants at Kawerau and Kinleith, the hydro-electric stations on the Waikato, and the impressive range of tourist attractions.

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Improvement of Hill Country Grassland

Surface-sown hill country showing typical reversion to secondary growth.

ONE of the most striking changes that has taken place in New Zealand is the massive conversion of the forested hill country into grassland with the use of fire. In the "Journal" for November 1913 A. H. Cockayne* stated: "Nearly 10,000,000 acres of the occupied land consist of permanent pasture that has been surface sown after the removal of the native vegetation has been effected by means of felling and burning . . . during the past decade nearly 90 per cent of the permanent pasture land that has been laid down consists of surface-sown forest land".

COCKAYNE in this article drew attention to what was then developing into one of the major grassland problems of the time, secondary growth: "A very peculiar feature of these secondary associations is their great vitality and ability to regenerate rapidly after being burnt, a feature that marks them off very strongly from true forest."

After discussing the need to sow and stock hill country grassland to the best advantage, he concluded with a sentence which was a good indication of the troubles that were to come: "Errors in seeding and management on cultivated land are comparatively easy to remedy, but when applied to surface-sown land that can never be profitably ploughed their effects must remain a permanent incubus upon the future utility of the pasture."

Prospects for general improvement of fertility of hill country grassland were not good until the laborious method of hand distribution of fertiliser was superseded by aerial application.

Control of Bracken Fern

At this time hill country farmers were faced with a number of problems in maintaining useful pastures. Control of bracken fern was most difficult when it came in on former bush country. Cockayne summed up its control in the "Journal" of June 1916: ". . . it possesses four fatal defects that make its control possible. These are the incapacity of the underground stems to develop fronds except in specially defined places, the inability of the frond to grow when once broken off, the extreme ease with which the frond may be broken before it expands or when it is in what is known as the curl stage, and

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* Director-General of Agriculture 1936-43.

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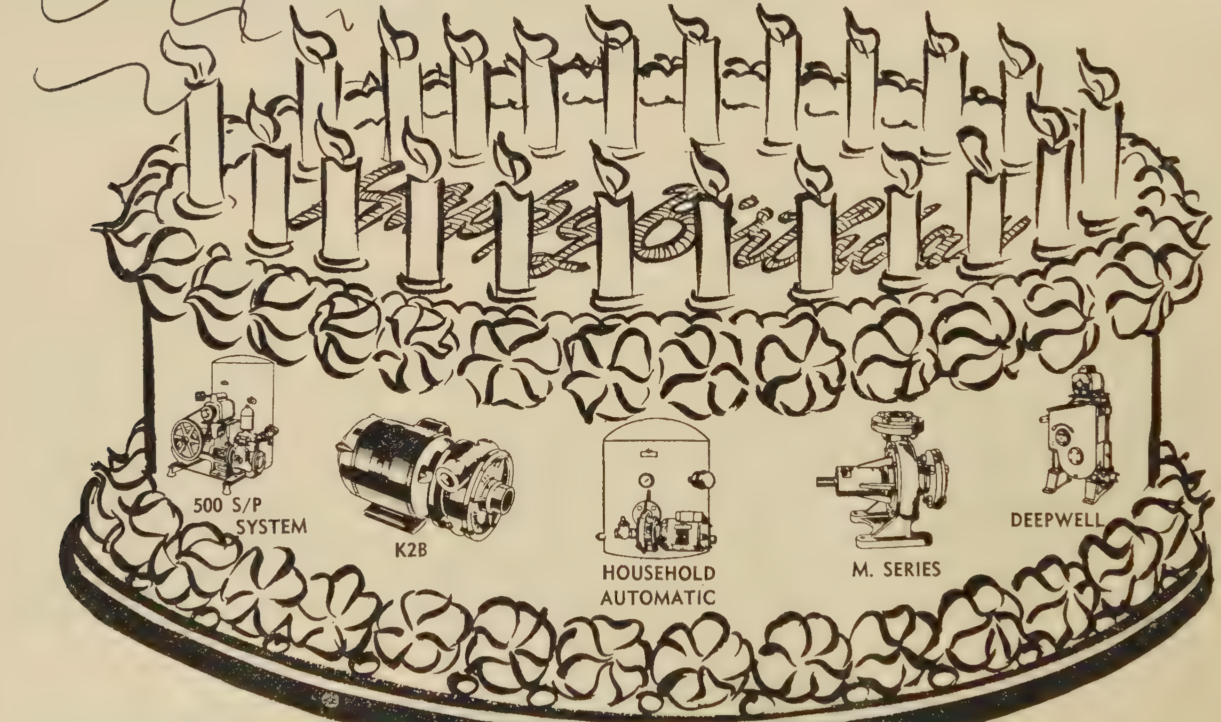
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Aerial topdressing and oversowing have provided a means of raising fertility over many hundreds of thousands of acres of hill country.

the long dormant season extending from autumn to late spring." Recognition of these facts has enabled bracken fern to be brought under control throughout the country.

Until the early 1920s, investigations into methods of improving hill country were based mainly on the observation of success or failure and on drawing conclusions from this.

In 1923 E. Bruce Levy (now Sir Bruce Levy) reported: "The writer hopes to be able to prosecute research more and more closely on our hill country generally. . ." These investigations, which were carried out in the back country of Taranaki on steep, difficult hill country, consisted of an examination of seeds mixtures, use of fertilisers, and the use of stock to control weeds such as bidibidi (piripiri), manuka, and hard fern. One of the important findings of these investigations was the desirability of including low fertility demanding species in hill country mixtures. For example, in the May 1927 "Journal" Levy recommended the following as a "good general secondary-burn mixture for all hill country having over 60 in. rainfall":

	Lb per acre
Browntop	2
Crested dogstail	4
Perennial ryegrass	6
White clover	1
Lotus major (uliginosus) ..	½
Danthonia pilosa	3
	16½

This type of mixture marked an important stage in grassland knowledge in that it changed the emphasis from high producing, short-lived plants to permanent but lower producing ones.

Sir Bruce Levy, an outstanding figure in hill country grassland improvement work for over 40 years. He was Director of the Grasslands Division, Department of Scientific and Industrial Research, from 1936 to 1952.

Topdressing

Even on land which had been successfully cleared of secondary growth and the worst of the weeds it was apparent that all was not well with the pastures. In 1926 W. J. McCulloch had written: "For some years past it has been clearly apparent to sheep farmers in certain parts of the North Island that the carrying capacity of the hill country is declining. . ." He continued by emphasising that the cause was declining fertility, and stated: ". . . an endeavour has been made by the Department of Agriculture during the past year (1925-26) to investigate the economy of topdressing selected areas of hill country by hand."

Twenty such areas were topdressed at costs averaging about 25s. per acre. This cost included fertilisers, transport, and application. The report indicated that the farmers concerned were well satisfied with the results.

In an article written in 1927 McCulloch stated that on hill country grassland ". . . a general move is perceptible in the direction of improving the lowered carrying capacity by topdressing. Only a few years ago the suggestion to topdress steep hill country would have been ridiculed as impracticable and economically unsound."

However, distribution of fertiliser by hand on hill country was onerous and disagreeable and as a result one man would topdress about 6 acres per day. The article described hand manure distributors, one of which it was claimed could be used to topdress 12 acres a day at 2 cwt per acre. Hill country topdressing still made very slow progress, largely because of the physical work involved in carting and distributing the manure. Over 20 years passed before any major improvement in topdressing techniques was made. This was the introduction of the blower.

C. J. Hamblyn (the "Journal", May 1949) after commenting on the difficulties associated with hand topdressing, described the blower method: "A rotary fan acting as a blower is used to get the fertiliser sufficiently high into the air to be windborne. . . . By shifting the machine to strategic points along the ridges. . . it is possible to get a surprisingly good cover-

(Continued at bottom of page 580)

The Ryegrass Controversy

PERENNIAL ryegrass has been one of the most controversial grasses in the history of grassland farming in New Zealand. Over the years many reasons have been given why it should not be used, but despite this its use has continued to increase.

FOR many years its lack of permanence, particularly in the South Island, belied its name; it seldom lasted as a useful component of pastures for more than two years. On the other hand, farmers continued to use it because its seed was easy and cheap to produce, it established rapidly, and it produced an abundance of feed a short time after it was sown.

Experiences with perennial ryegrass did, however, vary. The Hon. T. Mackenzie, Minister of Agriculture, told the New Zealand Agricultural Conference in 1911 (the "Journal", September 1911):

> Ryegrass seed produced in the South [Island] often quite fails to become in the least permanent when sown in portions of the North Island, whereas that from the eastern coast of the North Island is in similar localities quite permanent.

Though this fact may have been realised by others, little or no use was made of the knowledge.

In 1914 A. H. Cockayne wrote (the "Journal", March 1914) in a somewhat similar but more emphatic tone: "There is a very prevalent opinion that ryegrass seed harvested in the North Island, especially that from Hawke's Bay and Poverty Bay, is more perennial in character than seed from the South Island."

Later Cockayne commented (the "Journal", December 1918): "The failure of perennial ryegrass to be even semi-permanent in many soils in New Zealand does not seem to be in any way connected with climate, as ryegrass pastures, for instance, fail in permanence equally in Southland and Canterbury, with climates essentially different." He went so far as to say also: "No student of agrostology closely connected with the agriculture of the South Island can fail to realise the necessity of abandoning the almost pure ryegrass pasture as the main grassland of the farm over all those soils where the grass is virtually only a biennial."

This controversy continued in much the same vein through the early and mid 1920s and related to use of ryegrass on both low and hill country.

In 1926 E. Bruce Levy summarised the position of perennial ryegrass on hill country as follows (the "Journal", May 1926): ". . . perennial ryegrass on the hill country has sadly declined from major rank during the past 25 years . . ." In the same article he emphasised that ryegrass required high fertility: "The soil, however, which has carried ryegrass for the last 25 years or so, but which is now running to inferior grasses or weeds, should be topdressed by hand to win it back once more to ryegrass."

As a result of discussions he had with R. G. Stapledon, Professor of Agricultural Botany, University of Wales, who visited New Zealand in 1926, Levy was impressed with the possibilities of sorting out various strains in grasses and clovers. In 1928 he stated in the "Journal": "Just as species have been moulded to suit a particular set of environmental conditions, so too may there be variation in adaptability within the species itself. . . " He continued with a number of questions, the answers to which he was soon to resolve: "For general permanent pastures (in the North Island at least) the general opinion is that Hawke's Bay ryegrass is superior to Canterbury ryegrass."

Levy laid down trials in several parts of the country in which lines of ryegrass from Hawke's Bay, Canterbury, Southland, and Sandon were compared with each other and with other species. The results of these were so spectacular that further small plot trials were laid down at the Plant Research Station in Palmerston North. It became obvious from these experiments that a wide range of types of ryegrass was being marketed under the name "perennial". The outcome was the introduction of certified perennial ryegrass in the harvest of 1929-30. Within a few years a superior strain of white clover was also produced and introduced into the seed certification scheme.

Mixed Reception in South

In the North Island the new certified perennial ryegrass was accepted in areas where it was associated with adequate topdressing and a good white clover, but in the South Island, particularly in Canterbury, Otago, and Southland, it met a very mixed reception. Merchants and farmers pointed out that it was unpalatable and that stock would not thrive on it even though it was more permanent than their own ryegrass. Added to this, seed crops in some seasons in the South Island showed low germination.

Nevertheless certified perennial ryegrass continued to be sold and sown. Improved fertility and the encouragement of clovers have assisted in its acceptance. Even today, however, certified perennial ryegrass is not accepted by all farmers and there is unquestionably a tendency for the pendulum to swing away from perennial ryegrass, particularly in the drier areas of Canterbury.

Despite this, perennial ryegrass is still the mainstay of grassland farming throughout New Zealand; it is likely to remain so for many years. Only the breeding of a more palatable and higher producing strain is likely to displace the present strain of certified perennial ryegrass.

Hill Country Grassland

(Continued from page 579)

age on typical hill country." This revolutionary method of application resulted in a marked stimulus to hill country topdressing, because it reduced considerably the disagreeable work associated with hand application.

Aerial Application

Topdressing by aeroplane was seriously considered about 1945, but, despite the best endeavours of the promoters, made no progress because it was believed that no suitable aircraft were available. Interest in the possibilities of applying fertilisers from the air had been stimulated, however, and in the October 1948 "Journal" the Minister of Agriculture (the Hon. E. Cullen) stated: "It is thought that air transport and the dropping of supplies at selected points may be followed by aerial distribution of fertilisers on a commercial scale." He added that arrangements had been made for various Government Departments to conduct a trial with a modified service aircraft. This and a number of other trials proved successful.

In April 1950 P. B. Lynch reported in the "Journal": "Topdressing land with fertilisers from aircraft has been shown to be practicable and there is every chance that a rapidly increasing area will be topdressed by such means in future." That this forecast was reasonable is shown by the fact that in the year ended 31 March 1960 an estimated 460,843 tons of fertiliser were distributed by aeroplanes.

Though much emphasis has justifiably been placed on aerial topdressing, the associated marked increase in the surface sowing of clovers on hill country should not be forgotten. Without this, much of the advantage of aerial topdressing would have been lost.

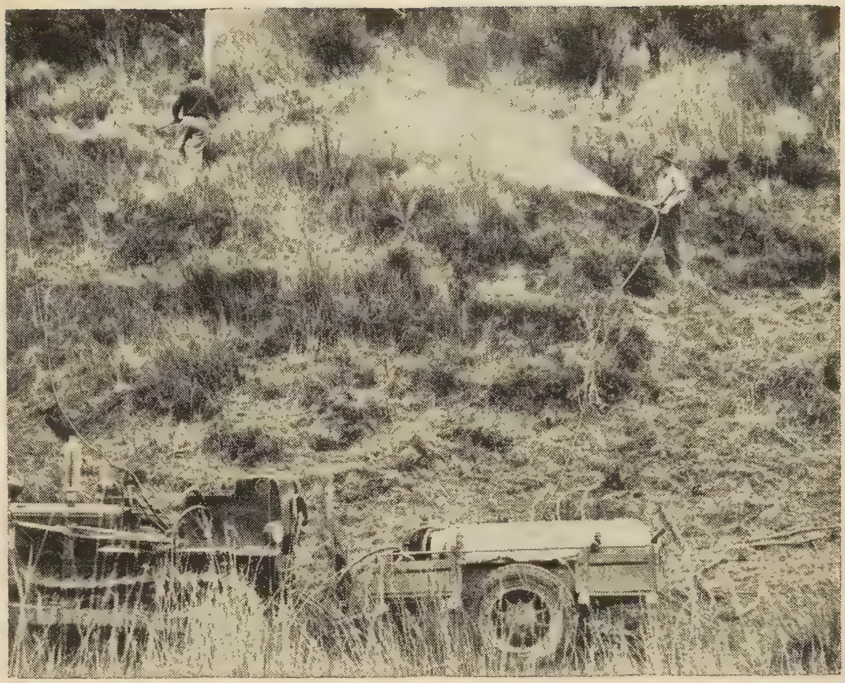
Weed Control

FROM early Biblical times weeds have played a significant role in man's struggle to develop agricultural production. The Department of Agriculture owes its inception to the passing of the Noxious Weeds Act in 1892, when blackberry, gorse, Californian thistle, and ragwort were the worst problems.

BY 1910, when the "Journal" began, many methods of control had been developed, none of them very satisfactory. At Ruakura sulphuric acid was tried without success on Californian thistle. The possibilities of fungi as weed control agents were discussed by agricultural workers and farmers alike. In the August 1910 issue A. H. Cockayne, one of New Zealand's foremost biologists and Director-General of Agriculture from 1936 to 1943, referred to the possibility of using various rusts to control Californian thistle, blackberry, and sweet brier as a "forlorn hope". In 1927 G. H. Cunningham* reiterated Cockayne's opinion: ". . . with our present knowledge and technique it is not possible to use in the economic control of weeds . . . fungi which occasionally attack them under natural conditions." (The "Journal", April 1927.)

In support of his earlier statements Cockayne in the July 1913 "Journal" discussed the scientific aspect of weed control. He remarked: ". . . the determining of how to alter the factors that influence their spread is really of much greater influence than the mere adoption of mechanical methods for their partial or total removal . . ."

For the most dreaded weed of the time—Californian thistle—mechanical methods of control were most widely advocated. For blackberry, chemical rather than agricultural methods were advocated. Kerosene, arsenicals, and common salt were suggested. So unsuccessful were these methods that in 1924 a bonus of £10,000 was offered by the New Zealand Government for the discovery of a suitable non-mechanical method of killing blackberry. The bonus was not withdrawn until 1948.



The availability of selective weedkillers since the late 1940s has enabled farmers to control weeds for which up to that time no satisfactory method had been developed.

Weeds were often called by various common names; for example, articles in the same "Journal" referred to "Californian" and "Canadian" thistle. A series of articles on weeds and their identification begun in the "Journal" in August 1915 did much to standardise common names, especially as each contained excellent drawings by the author, E. H. Atkinson.

In November 1926 the "Journal" reviewed F. W. Hilgendorf's "Weeds of New Zealand", the first real attempt at supplying a handbook on weeds and their control.

Control by Insects

Yet another method of weed control—by insects—was put forward in 1926 by R. J. Tillyard (the "Journal", March and April 1926). Control of St John's wort, ragwort, and gorse by this method was attempted.

Sodium chlorate as a weedkiller for ragwort was introduced during the late 1920s and remarkable results from it were reported by J. W. Deem, Director of the Fields Division, in the May 1930 "Journal". Unfortunately, the "Journal" had very soon to report users of sodium chlorate being burnt and this risk was always an unsatisfactory feature of the weedkiller. Later articles on weed control gave a good deal of emphasis to ragwort, which appears to have increased with the use of topdressing on light soils, particularly dairy farms. In fact more detailed work on ragwort was conducted than for any other weed.

During the war years 1939-45 one period in weed control ended and another began. The period ended with one of frustration for the many workers, Cockayne, E. B. Levy, Tillyard, B. C. Aston, D. Miller, and others; fungi failed, the use of insects was not as promising as expected, and chemicals were hazardous, gave poor results, and were costly.

The new period saw methods of weed control advanced more rapidly than any other aspect of agricultural technology. The initial series of experiments with the first of the true organic selective weedkillers, DNOC, a highly poisonous unpleasant dye, was reported on by P. B. Lynch and K. Cottier in the August 1946 "Journal". This material gave way to MCPA, 2,4-D, and dinoseb, forerunners of materials that were to revolutionise weed control.

The first authoritative statement on the properties and effects of the new weedkillers was a report of the subcommittee of the Field Crop Committee compiled by Lynch and published in the November 1948 "Journal". This article was later reprinted as the first bulletin titled "Chemical Methods of Weed Control". The bulletin was rewritten in 1952, in 1955, and again in 1959. Progress in the development of selective weedkillers has been so rapid that few of the recommendations made in the bulletins printed in 1948 and 1952 stand today.

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* Director of the Plant Diseases Division, D.S.I.R., 1936-57.

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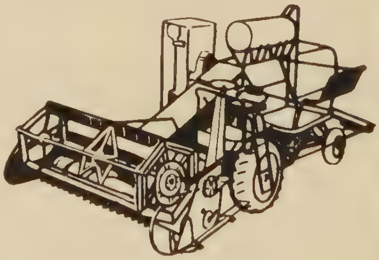

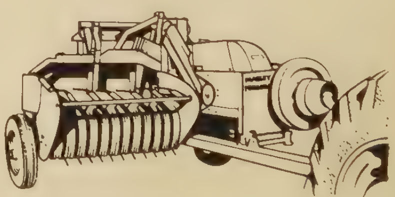

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Soil Conservation

THOUGH early issues of the "Journal" make no special mention of the extent of soil erosion in New Zealand, there are many references to depleted areas in the South Island and experiments to reclothe the bare soil. The noted botanist Dr L. Cockayne spent a good deal of time in Central Otago endeavouring to establish species on the mountain slopes in that region, and his investigations were reported fully in a series of "Journal" articles from 1914 to 1922. He described depletion caused by rabbits, indiscriminate burning, and overgrazing, and the climatic obstacles to regrassing. Many other writers at the time made passing references to depletion of the mountain slopes in the South Island, and though the rabbit pest was chiefly blamed, there was a good deal of controversy about the deleterious effects of burning tussock.

COCKAYNE'S investigations for promising species to reclothe the desert areas of Central Otago were continued, and have been the subject of numerous botanical investigations. In 1938 G. G. Calder described experiments on Mt Pisa Flat, and concluded that vegetation could be restored on denuded country by completely closing it to grazing animals for two to three years and surface sowing of suitable pasture species. One of the species which showed promise was tall oat grass, which had also been successful in Cockayne's plots. Because of the reduction of rabbits through the vigorous policy of rabbit boards in this region, the successful use of aerial topdressing and introduction of clovers, and the control of burning by catchment boards, S. H. Saxby was able to present a much more favourable picture of Central Otago when he reviewed the position in the "Journal" of September 1957.

Soil erosion came into prominence during the 1930s when many journals, books, and even novels dramatised its wide occurrence in the United States. That New Zealand could suffer the same dire consequences was not fully appreciated until after the Hawke's Bay earthquake, when several disastrous floods, notably the Esk Valley disaster (reported by R. P. Hill in the July 1938 "Journal") drew attention to the instability of areas on the east coast of the North Island.

Officers of the Fields Division drew attention to sheet erosion in North Auckland at that time and the need to establish better cover by clover establishment and topdressing, though the difficulties of clover introduction on the light bare hill swards of danthonia and browntop were stressed.

A visiting Chinese, Dr Lui-yung Li, in a series of "Journal" articles between July and October 1943 outlined soil conservation measures which were necessary in New Zealand. Probably the most detailed article on the occurrence of soil erosion in New Zealand and what could be done to check it was that by J. E. Bell and D. A. Campbell in the December 1945 issue. They described the organisation of the Soil Conservation and Rivers Control Council, which had been set up by the Government in 1941 to deal with soil erosion problems in New Zealand.

Soil conservation measures being carried out, mainly by tree planting, on the Poverty Bay farm of Mr A. B. Williams, who had long realised the serious problem of slumping on the steep and unstable soils of the district, were described by V. P. Boot in April 1946.

A warning that soil erosion in New Zealand could have serious consequences was given in the September 1948 "Journal" by the Minister of Agriculture, the Hon. E. Cullen.

Apart from such measures as tree planting for stability and the construction of furrows, graded banks, and detention dams, soil conservation depends essentially on good farming practices. This aspect has been stressed in the "Journal" from 1948 onward. Specific methods of soil conservation were discussed by D. A. Campbell (August 1957), G. G. Calder (September 1957), A. N. Glass (October 1957), and R. V. Maxwell (March 1959).

An account of development on a South Island hill country farm, one of six conservation demonstration areas organised by the Soil Conservation Council operated through the South Canterbury Catchment Board, was given by H. A. Arthur in the February 1959 "Journal". He pointed out how aerial topdressing, reseeding, closer subdivision, and control of rank tussock by cattle instead of burning had all contributed to better cover on the mountain slopes and greater stability of the soil.

Silt and debris deposited by the disastrous flood in the Esk Valley in 1938.

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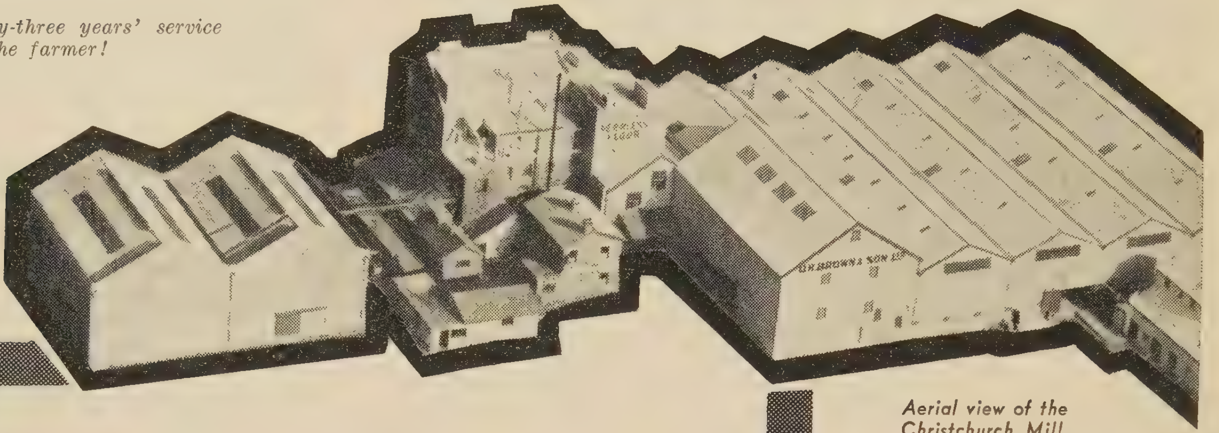

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Phormium

PHORMIUM or New Zealand flax was one of New Zealand's first exports and it remained of considerable importance for many years. This is reflected in early issues of the "Journal", in which regular monthly notes on phormium by W. H. Ferris, then Chief Hemp Grader, appeared. Hemp and tow grading returns were also included regularly up to 1915. Displays of fibre were a feature of the Department's exhibits at winter shows and some of the first illustrations to appear in the "Journal" are of these displays.

THE October 1910 "Journal" refers to experiments at Weraroa with varieties of phormium. They were established from seed, and plants showed a very wide variation at the seedling stage. The same problem exists today; hence all plants are taken from good type mature plants.

The development of a new strain of phormium by A. W. Green, then horticulturist at Ruakura Experimental Farm, is recorded in the July 1911 "Journal". It was a cross between the varieties "Awanga", noted for its luxurious growth, and Putaiore, a medium growing variety with a high percentage of fine quality fibre and noted for its disease resistance. The new variety was quick growing, luxuriant, disease resistant, and gave a high percentage of a medium quality fibre. It was also noted that this new variety would not breed true from seed and had to be multiplied from plants taken from good type mature plants.

Price Fluctuations

In 1911 Ferris records that mills had to close down over the winter to prevent frost damage to freshly cut stumps. The price for fibre dropped to £17 a ton and the outlook did not warrant any great activity in phormium production and disease was prevalent. In the December 1911 "Journal" Ferris reports only a small demand from London and that the price being obtained was just payable.

An appeal to millers to improve their methods of stripping and washing to produce better grade fibre was made by Ferris in the April 1912 "Journal". He also reported that disease had been prevalent. Then in the September "Journal" Ferris recorded the variations of a new type of stripper made by Mr Claydon, Woolston, Christchurch, known as the Claydon Maude scraper, which improved the cleaning of the vegetable matter from the leaves and left the fibre in a better condition than the beater type of stripper. Bright market prospects for fibre owing to a drought in the Philippines were mentioned in the September 1912 "Journal". As had been forecast prices for phormium fibre rose and New Zealand millers, though they found it hard to meet the demand for fibre, took the opportunity to introduce phormium fibre into new channels. However, at the end of 1912 Ferris reported that with better drainage of many of the swamps, these lands were proving valuable for agricultural purposes and phormium areas were gradually disappearing.

The following year Ferris recorded that the increased prices brought about a large output of fibre; but he complained continuously that the fibre was of low quality due mainly to the high percentage of diseased leaf in the swamps, to insufficient care in drying and bleaching of the fibre on suitable drying fences, and to poor washing and stripping. Throughout 1913 Ferris was continually appealing for better quality fibre.

The November 1914 "Journal" recorded that the phormium fibre industry was feeling the effects of the world war probably more seriously than any other branch of primary production. At this time the Government was offering a bonus of £12,000 for better methods of dressing the fibre. A commission investigated the applications and though some grants

[*McCusker*

Phormium being delivered to a Marlborough mill about 50 years ago.

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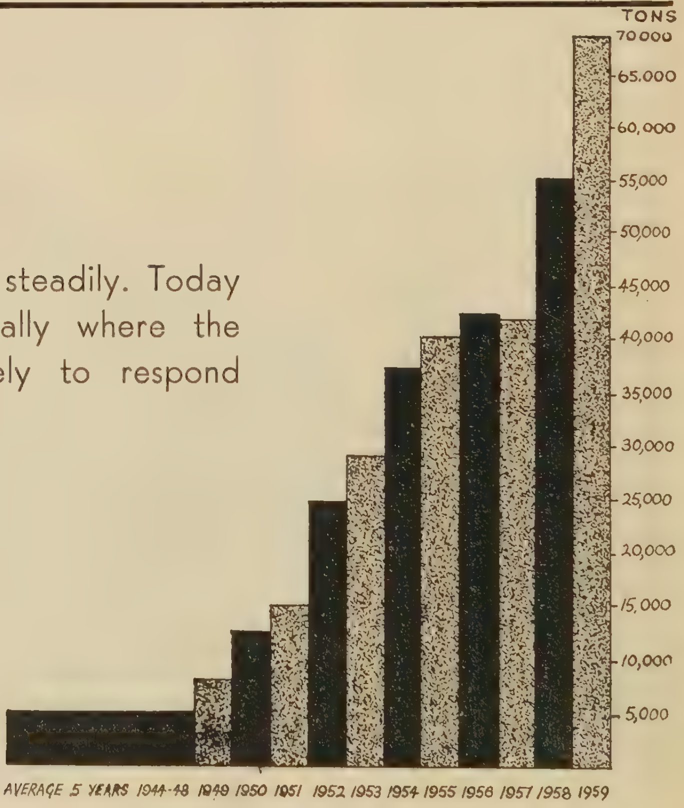

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were made, the bonus offer did not produce any outstanding improvement.

Not even flax growers were free from the depredations of insect pests as several articles on the flax grub, which appeared in the "Journal" between 1915 and 1918, show. One of the authors, David Miller (Director of Cawthron Institute from 1956 to 1959) was specially engaged by the Department to study the problem in the Manawatu.

Yellow Leaf Disease

The first description of the disease yellow leaf, which today is one of the main problems in maintaining good phormium stands, is given by Dr Leonard Cockayne, the eminent botanist, in the August 1919 "Journal". Cockayne had been engaged by the New Zealand Flax Millers' Association to make a study of the disease with a view to its control. Further articles on this disease appeared in 1921 and 1922.

In 1921 E. H. Atkinson, of the Biological Laboratory, wrote a number of valuable articles on *Phormium tenax* and the New Zealand fibre industry in the following sections: 1. Historical. 2. Botanical. 3. Conservation and cultivation. 4. Milling process. 5. Grading, markets, and uses. 6. Diseases and insect pests. These articles were later reprinted and published as a bulletin in 1922. This bulletin, the most comprehensive record of the phormium industry in New Zealand, has, however, been out of print for many years.

The disastrous effects of low cutting of stands were pointed out by G. Smerle in an article in June 1923. Notes on some experimental work done by the same author on the growth of phormium were published in January 1927.

Research on breeding and cultivation of phormium was described by J. S. Yeates in the February 1928 issue, and in the March 1929 issue the chairman of the research council stated that the work of Dr Yeates was showing promising results, but a later report mentioned that research had been retarded by lack of funds.

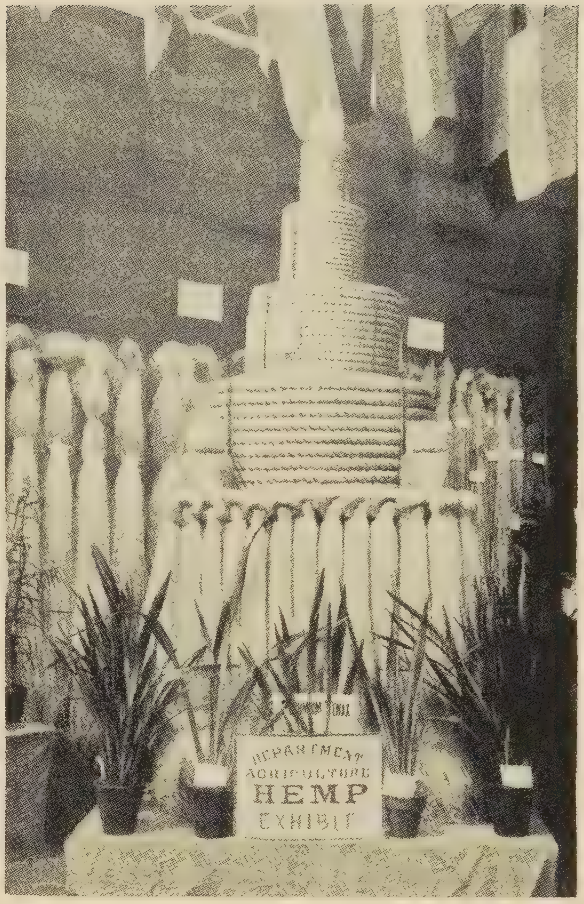
A Government bonus of £10,000 for major improvements in extraction and dressing of fibre was announced in the March 1930 issue by the Minister of Agriculture (the Hon. G. W. Forbes). However, it failed, as had an earlier similar incentive, to produce results.

A world shortage of hard fibres and jute from India made it imperative to give a stimulus to the growing and milling of phormium just after the Second World War, and to meet this Cabinet approved of the following measures for the rehabilitation of the industry (the "Journal", May 1948):

1. A guarantee by the Government to purchase the total annual production of phormium fibre at prices fixed from time to time.
2. The making available of finance to millers and others.
3. Consideration of improved conditions of wages and accommodation for workers, with the training of young men to fill key positions at the mills.

Planting

Recently the planting of areas to replace the fast-disappearing native swamp areas being diverted over the years to farming has become necessary. A mechanical method of planting devised by the Department is described by H. W. T. Eggers in the January 1958 "Journal".



Displays of phormium fibre were a feature of Department of Agriculture show exhibits 50 years ago. This illustration appeared in the third issue of the "Journal".

Topping of Pastures

It was once common on dairy farms to leave rank summer growth which could not be eaten at that time and feed it off as winter roughage. If there was a considerable bulk, it was often cut for hay. However, at the Ruakura Farm of Instruction mowing of pastures in summer to control rank growth was practised at least by the early 1920s. Writing in the August 1925 "Journal", P. W. Smallfield pointed out the advantages:

> *It may often be observed in wet summers that the milk yield falls in January while there is still abundant rank feed in the dairying pastures. The reason for this is that the cows neglect the rank growth, which they seem to know instinctively is unsuitable for them to produce milk on, and continuously graze the patches of grass which they have kept down. So that actually the cows are not getting sufficient food, while there appears to be abundant food in the pasture. A rank growth of grass left on the pasture has a very deleterious effect on the grass sward.*
>
> *. . . summer mowing of the rank growth in the dairying pastures from November to February . . . offers the best opportunity to the average dairy farmer to improve his pastures.*

These comments are as applicable now as they were when they were written. Mowing (or topping) of pastures to control summer growth is now an accepted practice on most dairy farms.

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Have been consistent advertisers in this Journal for nearly 20 years

This advertisement appeared in the Journal of Agriculture, January 1942. . . . Brown Bros. association with this publication and its related departments through the passing years has been a happy connection. Close on 20 years continuous appearances reflects most highly the regard and potential of this publication in reaching Brown Bros. farming community market. B118

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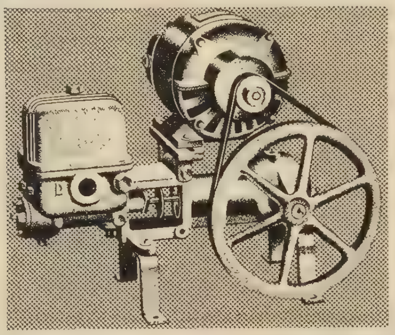

Compact, perfectly balanced and most popular unit on the market today . . . the SPEEDWELLETTE gives smooth, noiseless running, pumping up to 200 gals. per hour at 50 lb. pressure up to a head of 115ft. YOU NEED A SPEEDWELLETTE FOR WATERING STOCK, HOUSEHOLD USE, ORCHARD AND GARDEN, STORAGE TANKS, DEWATERING, IRRIGATION, ALL EMERGENCIES.

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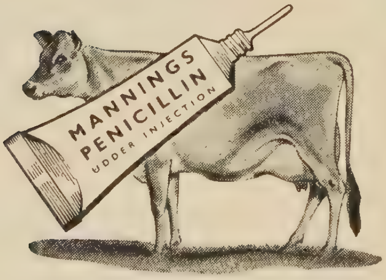


FOR MAMMITIS

IN THREE STRENGTHS

'25' '50' '100'

with the thin, smooth nozzle. Available in either round or flat tins.

MANNINGS PROCAL

Hypodermic Penicillin

THREE STRENGTHS

'100' '500' '1500'

FOR SHEEP after assisted lambing, and all farm animals. Bloodpoisoning and Blackleg in Sheep, Footrot in Cows and Pigs, Arthritis in Lambs and Pigs. In flat tins with hypodermic needles.

Scientifically manufactured under Laboratory control with special machinery to provide a consistently fine, even texture ensuring every injection without blockage.

Fencing

Paling fence sheep yards which are believed to be 50 years old.

THE native timber post and batten and seven wire fence was the standard subdivisional medium when the "Journal" was first published and was the subject of a number of advisory articles for more than 30 years. In the May 1914 issue a member of the Ruakura experimental farm staff described the most efficient methods of construction. Though, by later standards, posts and battens were very cheap and plentiful, the article stated ". . . puriri [is] the best fencing timber, but, as this is now difficult to obtain, totara will be found the next most suitable material". During the 1940s the fact that the days of general abundance of native timber for fencing were over was manifest in articles on the making and use of concrete posts. In more recent years, with the added difficulty in obtaining high grade wooden posts, the concrete post has become more widely used.

AN article by F. J. S. Holden in the November 1950 "Journal" on a new type of fence evolved by a southern Hawke's Bay farmer, Mr C. Hunter, introduced this type of fence in which only two or three posts to the chain are used and wooden battens are replaced by lengths of light galvanised chain anchored to wooden or concrete blocks sunk in the ground. The Hunter fence was evolved to deal with the high cost of subdivisional fencing in hill country in which, immediately after the Second World War, considerable lengths of very badly deteriorated boundary and subdivisional fencing had to be replaced.

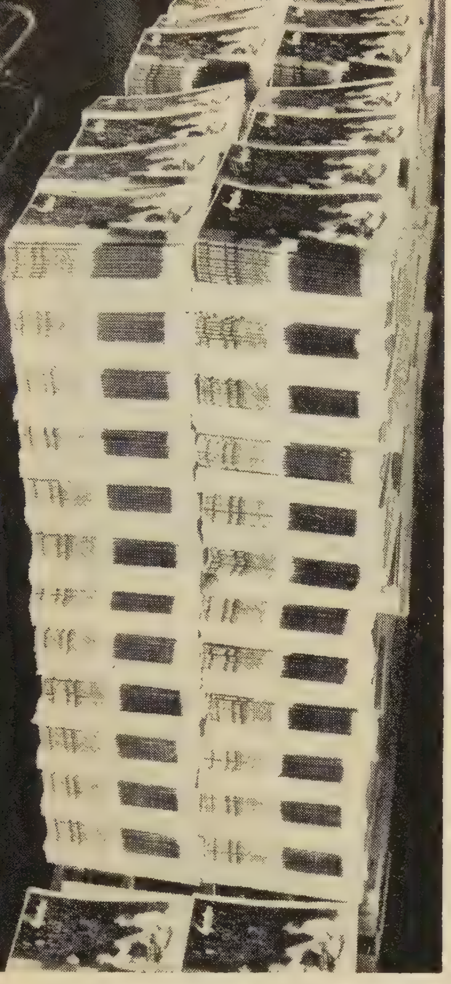
The experiences of hill country farmers in the southern part of the North Island with different types of fences over the previous few years were surveyed by R. G. Warren in the April 1959 issue. It was found that a great deal of new fencing had been constructed and the standard seven wire fence was the principal type with concrete posts increasing in favour. The Hunter fence, despite its lower cost, had not been widely adopted, its less solid appearance telling against it and it was also unpopular with fencing contractors.

The electric fence was first used in New Zealand about 1937, though it had been in use for some years in America before this. The first detailed "Journal" article appeared in June 1939, when a Te Kuiti farmer described his experience with the electric fence as an aid to hill country subdivision. In the July 1940 issue field officers from many parts of the country described the use farmers were making of the new type of fence. It was apparent by that stage that the electric fence would be most important as an aid to grazing management on dairy farms, where the fence would be under close observation and could be moved frequently. Attempts to use electric fences on hill country properties were less successful, shorting of the wires through contact with rank vegetation being one of the principal defects. For dairy farmers the electric fence has become an important aid to grazing management and the conservation of winter feed.

In the May 1959 issue details of the type of electric fence constructed on the Massey College hill country property in southern Hawke's Bay were given. The article outlined the difficulties sheep farmers had encountered with the older type of electric fence and also gave details of the newer four wire fence complete with a wind charger unit, the cost (about £160 per mile), and the circumstances when its use was inadvisable.

The impact of aviation on agriculture was manifest in a description in the July 1955 issue of a public demonstration, after a series of inter-departmental trials, of the possibilities of delivering fencing materials on hill country by air. Adaptations of standard material and new mouldings and materials for aerial dropping that were then demonstrated have not yet had an appreciable effect in fencing practices, but subdivisional costs are so important a factor in farm management, particularly on hill country and in relation to the efficient use of increased carrying capacity, that continued evolution can be expected.

▼ Aerial operations in farming have been developed to include the dropping of fencing materials, which was first successfully demonstrated in trials in 1955.



The First 50 Years of Publication

By J. W. McArthur

THOUGH 50 years is not a long life for a publication, even in a young country like New Zealand, the golden jubilee of one is a notable event. "The New Zealand Journal of Agriculture" has now spanned a half-century of publication and in that time has brought to the Dominion's principal industry a mass of information about agriculture. The story of the "Journal's" development in giving that service to farming and its setbacks and successes from 1910 to 1960 is outlined below.

DISSATISFACTION with the existing means of disseminating the Department's teachings of scientific farming was the prime cause of the founding of the "Journal" in 1910. Previously all the information about the Department's experimental work was published either in its annual report, which beside growing into a substantial book of 548 pages had built up a distribution list of some 8,000 copies, or the various bulletins and leaflets then issued.

Protagonist of the suggestion of starting a monthly journal along the lines of what was being issued by State Governments in Australia was the Minister of Agriculture, Industries and Commerce, and Tourist and Health Resorts, Thomas (later Sir Thomas) Mackenzie, who contended that the chief advantage of such a magazine would be that instead of having to wait, sometimes for as long as 11 months, for information to appear in the annual report, the farming community could get it as soon as it was available. That thought was the tenor of his introductory message to readers in the first issue in June 1910 and later he stated: "I have established a monthly 'Journal' for the Department of Agriculture, the object being to bring the scientific, expert, and practical knowledge possessed by the experts engaged on the various services of the Department within the reach of every farmer in the country".

The shape of the new publication was fashioned by G. Bisset, who had been Editor of Publications in the Department and who from 1910 to 1911 was the first of the magazine's seven Editors.

The First Issue

To 1960 eyes the 78-page "The Journal of the New Zealand Department of Agriculture" for June 1910 appears somewhat quaint. Its half-tone cover of an overdetailed montage of 13 illustrations ornately linked to the scroll background of the title now looks an oddity. Its headings were timid, its by-lines almost apologetic, and its illustrations sparse; it was printed on an octavo page (a little more than 6 in. x 9½ in.) in one column almost 4½ in. wide (a style which was retained for nearly 28 years). However, for all its shortcomings by today's standards of magazine production it was a brave little venture and "met with a very encouraging reception".

That initial issue contained the first of many articles to come from two of the "Journal's" most prolific contributors—B. C. Aston, who in 1899 was appointed Chemist in the Department and whose articles appeared in almost every volume of the "Journal" from 1910 to 1936, and A. H. Cockayne, the Department's Biologist in 1910 and later its Director-General.

Two other well known authors in those early days were W. M. Singleton and Primrose McConnell. Mr Singleton, whose first article in the "Journal" was published in the August 1910 issue, when he was Assistant Director of the Dairy-produce Division, was Director of the Dairy Division from 1921 to 1944. Mr McConnell was Manager of the Moumahaki Experimental Farm and later Manager of the Ruakura Farm of Instruction and contributed some 75 articles on many different subjects between 1910 and

The Changing Face of the "Journal"

1915, when he left the Department to direct a training farm for boys in the Auckland district.

Early Vicissitudes

Disappointed with the support that was being given to the "Journal" by farmers in 1911, Thomas Mackenzie considered discontinuing publication of it. The number of subscribers was then 3,250 and the annual subscription 2s. 6d.

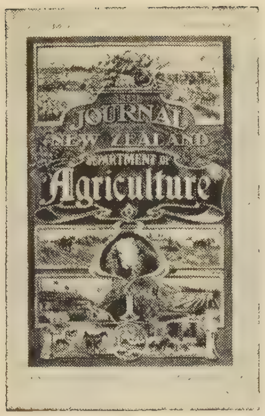
When the possibility of the magazine's going out of existence became known many pleas for its reprieve were made and newspaper, Farmers' Union, and private opinion was strongly against cessation of publication. Various suggestions for increasing the number of subscribers were offered and through spread of interest the circulation by 1912 had nearly trebled.

First Trade Advertisement Accepted

With a monthly distribution of over 9,000 copies the "Journal" then had backing for the claim that it provided a good medium for advertising, and in 1912 the first trade advertisement was accepted by the Editor, C. E. Cuming, who had followed Mr Bisset as Editor in 1911.

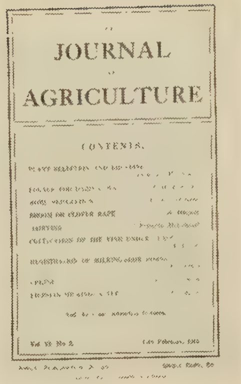
Except for a break of a year or two after the First World War and in the early 1930s trade advertisements have been included in the "Journal" since; moving with the trend of the last 30 to 40 years they have grown in volume, but have always been restricted to a fixed proportion of the contents of each issue so that the advisory function of the publication is not impaired.

In 1913, when circulation had reached almost 12,000, Mr Cuming replaced the half-tone montage cover with a type-only cover, at first on white paper and later on a heavyweight buff cover paper, on which the prominent items of the issue were


Journal
New Zealand
Department of
Agriculture

1910

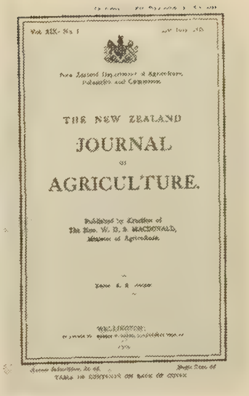
From the flowery design of 1910, which was so typical of the vogue for ornateness at the beginning of the century, the "Journal" cover has evolved into today's attractive four-colour illustration showing usually a farming scene or a subject associated with farming. After the colour advertisement had given way to the colour illustration in 1944 the covers were reproduced from paintings by Wellington artists. The use of colour transparency photographs was adopted in 1949, and in the last 11 years some 115 of these photographs have been reproduced on the "Journal" cover and have drawn much comment and many requests for copies.


JOURNAL

AGRICULTURE

CONTENTS.

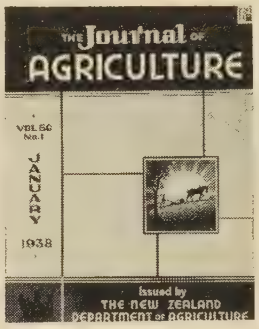
1913


THE NEW ZEALAND

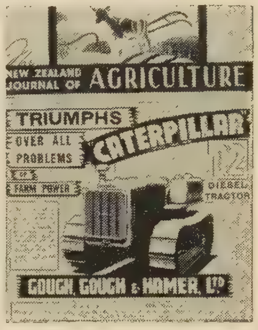
JOURNAL

AGRICULTURE.

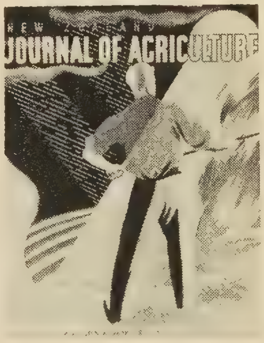
1919


The Journal of
AGRICULTURE
VOL. 56
No. 1
JANUARY
1938
Issued by
THE NEW ZEALAND
DEPARTMENT OF AGRICULTURE

1938


NEW ZEALAND
JOURNAL OF AGRICULTURE
TRIUMPHS
OVER ALL
PROBLEMS
OF
FARM POWER
CATERPILLAR
DIESEL
TRACTOR
GOUGH, GOUGH & HAMER, LTD

1941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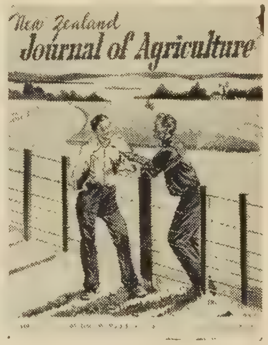
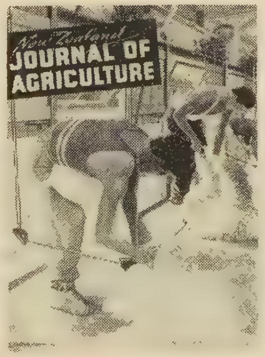
JOURNAL OF AGRICULTURE

1944


New Zealand
Journal of Agriculture

1945


New Zealand
JOURNAL OF
AGRICULTURE

1946

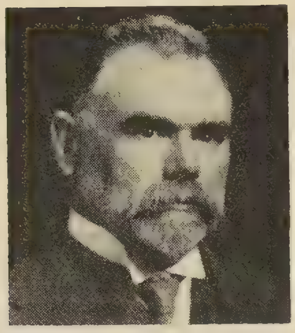
NEW ZEALAND
Agriculture

1948

NEW ZEALAND
Agriculture

1960

Ministers of Agriculture Since the "Journal" Began Publication


[S. P. Andrew

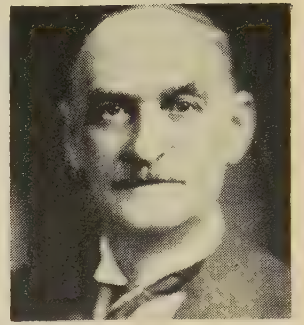
Sir Thomas Mackenzie,
1909-12.

[S. P. Andrew

W. F. Massey,
1912-15.

[S. P. Andrew

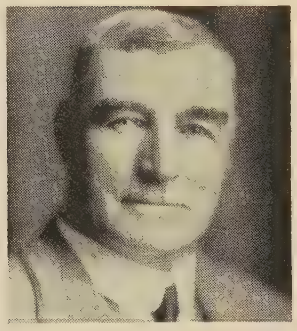
W. D. S. MacDonald,
1915-19.


[S. P. Andrew

W. Nosworthy,
1919-26.

[S. P. Andrew

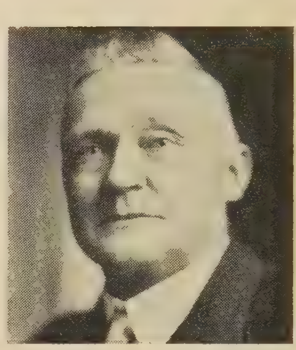
O. J. Hawken,
1926-28.


[S. P. Andrew

G. W. Forbes,
1928-30.

[S. P. Andrew

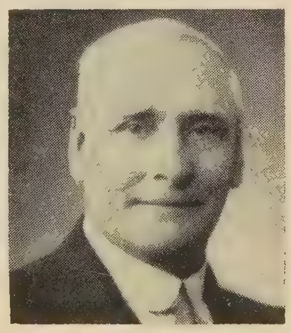
A. J. Murdoch,
1930-31.


[S. P. Andrew

D. Jones,
1931-32.

[S. P. Andrew

C. E. Macmillan,
1932-35.


[S. P. Andrew

W. Lee Martin,
1935-41.

[S. P. Andrew

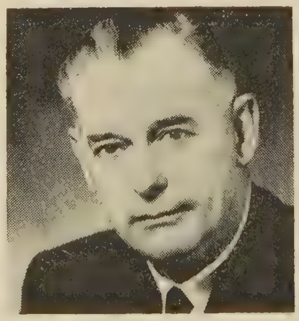
J. G. Barclay,
1941-43.

[S. P. Andrew

B. Roberts,
1943-46.

[Spencer Digby

E. L. Cullen,
1946-49.


[National Publicity

K. J. Holyoake,
1949-57.

[National Publicity

S. W. Smith,
1957.

[National Publicity

C. F. Skinner,
1957-.

listed. A more detailed list of contents was given inside the magazine on the back page.

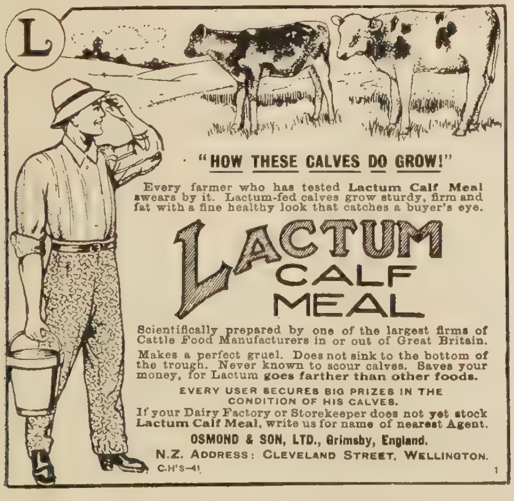
These changes were decided improvements, as apart from the six-monthly volume index there was no reference to articles in an issue. The title of "The Journal of the New Zealand Department of Agriculture" was contracted to the more simple "The Journal of Agriculture". Headings, though still small, were now presented in bolder type, illustrations were both more plentiful and larger, and issues were up to 132 pages in size.

This size was curtailed the following year after the outbreak of the First World War, during which some issues shrank to 54 pages through the shortage of paper. Nevertheless fresh subscriptions continued to be received and in 1914 circulation had reached about 18,000.

First World War Period

Except for strictures it imposed on size through paper shortages the First World War apparently did not severely retard the progress made by the "Journal", the circulation of which was continuing to grow. As the result of Mr Cumings's acceptance of another post in agricultural journalism the editorship changed hands in 1915, and R. H. Hooper was appointed Editor, a position he held for 18 years. Half-tone illustrations then were being used even more freely and were clearly and well printed. Line drawings, plans, and diagrams were beginning to appear more frequently.

During the war farmers were advised to compensate for the lack of men by higher efficiency and were asked to "use to the fullest extent . . . every appliance which science and invention have placed at our disposal".



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Every farmer who has tested **Lactum Calf Meal** swears by it. Lactum-fed calves grow sturdy, firm and fat with a fine healthy look that catches a buyer's eye.

LACTUM CALF MEAL

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Makes a perfect gruel. Does not sink to the bottom of the trough. Never known to scour calves. Saves your money, for Lactum **goes farther than other foods.**

EVERY USER SECURES BIG PRIZES IN THE CONDITION OF HIS CALVES.

If your Dairy Factory or Storekeeper does not yet stock **Lactum Calf Meal**, write us for name of nearest Agent.

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N.Z. ADDRESS: CLEVELAND STREET, WELLINGTON.

C.H'S—41 1

An early trade advertisement which appeared in the "Journal" shortly after the first trade advertisement was published in July 1912.

Contributed Over 200 Articles Each

[*S. P. Andrew*

B. C. Aston (left) and W. M. Singleton (right) were among the best known of the "Journal's" authors and both began contributing articles in 1910, Mr Aston in the first issue and Mr Singleton in the third. Mr Aston, who was appointed Chemist in the Department in 1899, continued writing for the "Journal" until 1936. Mr Singleton, whose articles were published up to 1943, retired the next year after having served as Director of the Dairy Division for 23 years.

The strongest and most persistent appeal made to producers at that time was that entreating the growing of more wheat. Several statements on the subject were published in the "Journal", and the Minister of Agriculture, W. D. S. MacDonald, pointed out that though production of meat and dairy produce was being maintained satisfactorily for export to Britain, the area in wheat needed to be increased to make the country self-supporting in that commodity. As an inducement to the sowing of wheat, farmers were offered financial assistance in the purchase of seed and manure and for the purchase of tractors to be used for wheat growing.

Envious Reading

Advertisements appearing about that time provide envious reading for today's consumer, as the prices of the goods advertised then stand out in bold relief against those of today. In 1915 a shipment of Egyptian phosphate was offered for sale at £4 17s. 6d. per ton, and £15 15s. was being asked for an 80-gallon per hour cream separator. The following year a 2¼ horsepower stationary engine was advertised at £27 10s. The tourer model of a popular make of car was selling in the early 1920s for £156 and its sedan counterpart for £255. A wheeled tractor made by the same firm could be bought for £166.

Dwindling Circulation

Owing to increasing cost of production, chiefly in paper, the subscription rate in 1921 was raised from 2s. 6d. to 4s. a year. Circulation was then about 14,000, but as a result either of this increase or the slump which occurred in the early 1920s it began to slide and its rate of descent was accelerated by a further increase of subscription rate to 6s. which was found necessary in 1922 to offset costs. This trend, which was accentuated by the great depression that started in 1929, went on for the next 12 years, the circulation sinking to its nadir in 1934, when the number of subscribers was smaller than 3,000.

Criticism of the publication was made on several grounds, the chief being that its content had drifted away from what the man on the land needed most and had become too scientific

AN HISTORIC PHOTOGRAPH FOR AN HISTORIC OCCASION

In congratulating the N.Z. Journal of Agriculture on its 50th Anniversary, The Firestone Tire & Rubber Co. of N.Z. Ltd., also looks back over a long period of service to the farming community.

The late Harvey Firestone, who founded The Firestone Tire & Rubber Company in 1900, was very aware of the need of putting farming equipment on rubber. This picture, taken back in 1936, shows the late Mr. Firestone testing Ground-Grip tractor and implement tyres under actual farming conditions.

Today, Firestone makes a complete range of tyres for all types of tractors, farm implements, farm machinery and farm transport. The Firestone ideals of economy, safety and comfort have brought a new sense of satisfaction to farmers.

THE FIRESTONE TIRE & RUBBER
CO. OF N.Z. LTD.

and technical. Another contention put forward was that the "Journal's" appearance was drab and in need of revitalising. In this regard it is certain that there was much room for improvement, as apart from a few minor modifications the presentation of the magazine had not altered in some 20 years, though the economies enforced by the depressions of the 1920s and 1930s severely limited the opportunity to do so.

On the retirement of Mr Hooper in 1933 R. P. Connell, an Instructor in Agriculture who had previously been Associate Editor of "The Dairyfarmer", became Acting Editor of the "Journal". After Mr Connell's appointment as Land Utilisation Officer in the Department H. I. Forde succeeded him as Editor in 1937.

Much Needed Face-lift

Mr Forde, who had been employed in journalism in New Zealand and Britain, had as his aim a more attractive and easily read magazine. He made many changes which transformed the appearance of the publication. The size was enlarged from octavo to quarto, with three columns of narrow type instead of the single wide one formerly. Headings were made bolder and the letterpress was spaced adequately.

The most marked improvement was the replacement of the plain buff cover by a three-colour cover in green, yellow, and black which displayed a line drawing of a symbolic woodcut of a ploughman and horse silhouetted against the rising sun, a motif that distinguished Departmental publications for several years. This cover was designed by H. G. Philpott, of the Dairy Division, and was finished off for the blockmaker by L. C. Mitchell, a Wellington artist, who also drew the motif.

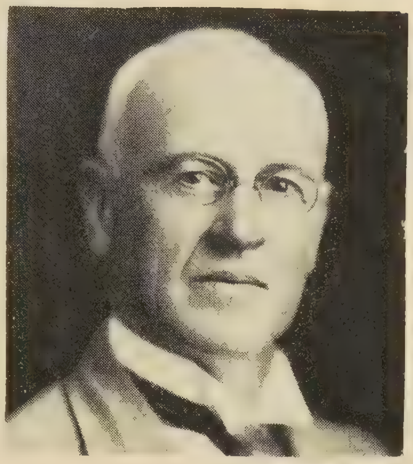
Congratulatory Messages

The first issue of the new-style "Journal" (January 1938), of 80 pages, was introduced by congratulatory messages from the Prime Minister (M. J. Savage), the Minister of Marketing (W. Nash), and the Minister of Agriculture (W. Lee Martin) and from chairmen and presidents of producer boards and farmers' organisations. To encourage wide acceptance of the "Journal" by farmers and to bring it within reach of all, the subscription was reduced from 6s. to 2s. 6d. a year.

That issue was also the first in which a section was included for the publication of notes from the Federation of Young Farmers' Clubs, which had adopted the "Journal" as its official organ, a concession in subscription rate being allowed to members.

The changes in format and content made by Mr Forde moved the Department to comment that year that the

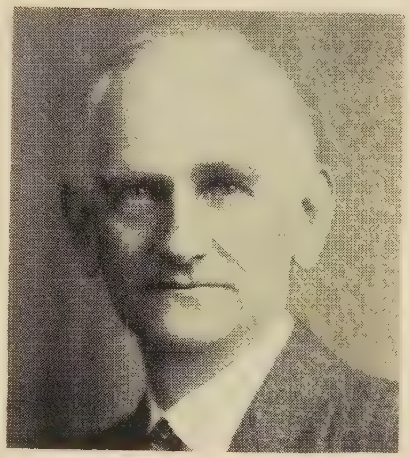
Directors-General of Agriculture Since 1910


[S. P. Andrew

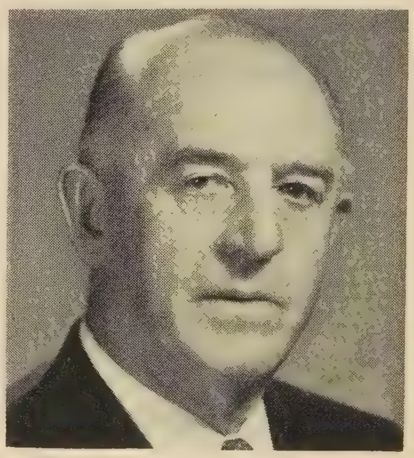
F. S. Pope, Secretary of Agriculture, 1908-19.

[S. P. Andrew

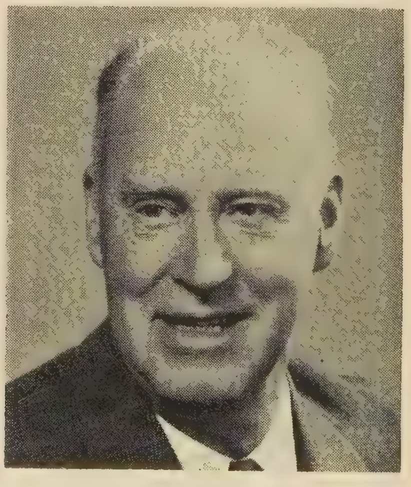
Dr C. J. Reakes, 1919-36.


[S. P. Andrew

A. H. Cockayne, 1936-43.


E. J. Fawcett, 1943-58.

R. B. Tennent, 1958.


P. W. Smallfield, 1958-.

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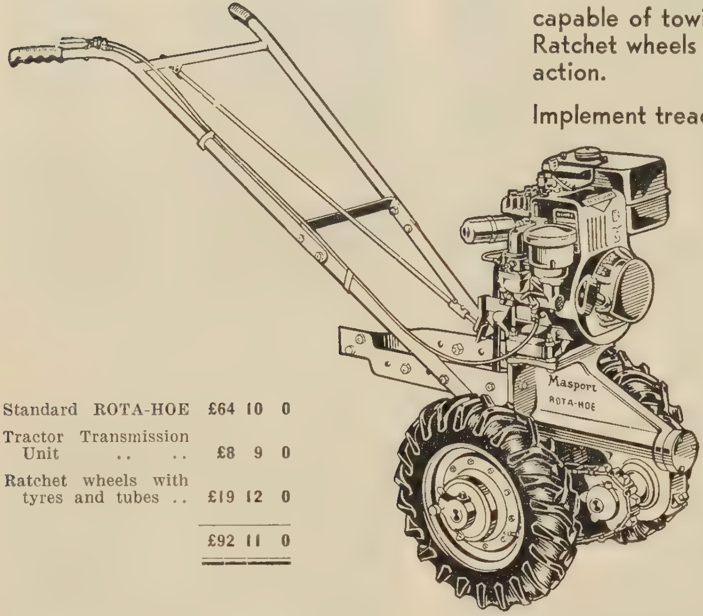

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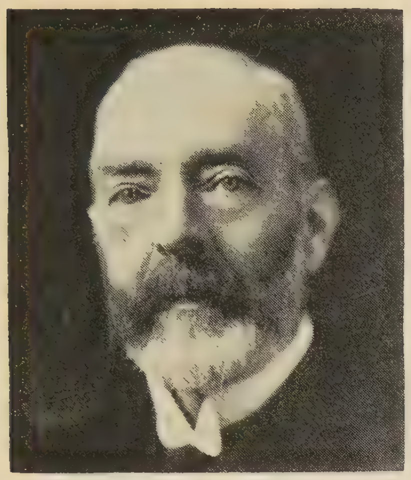
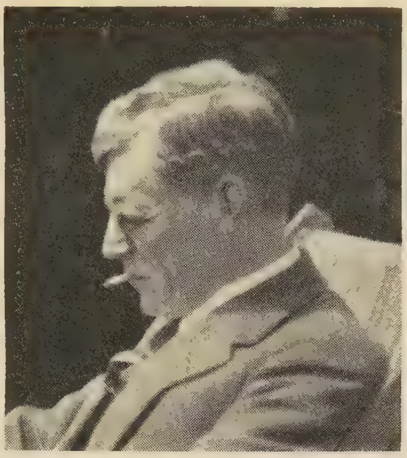
The "Journal's" Seven Editors



G. Bisset, 1910-11.



C. E. Cuming, 1911-15.

R. H. Hooper, 1915-33.

R. P. Connell, 1933-37.

H. I. Forde, 1937-42.

R. E. Owen, 1942-49.

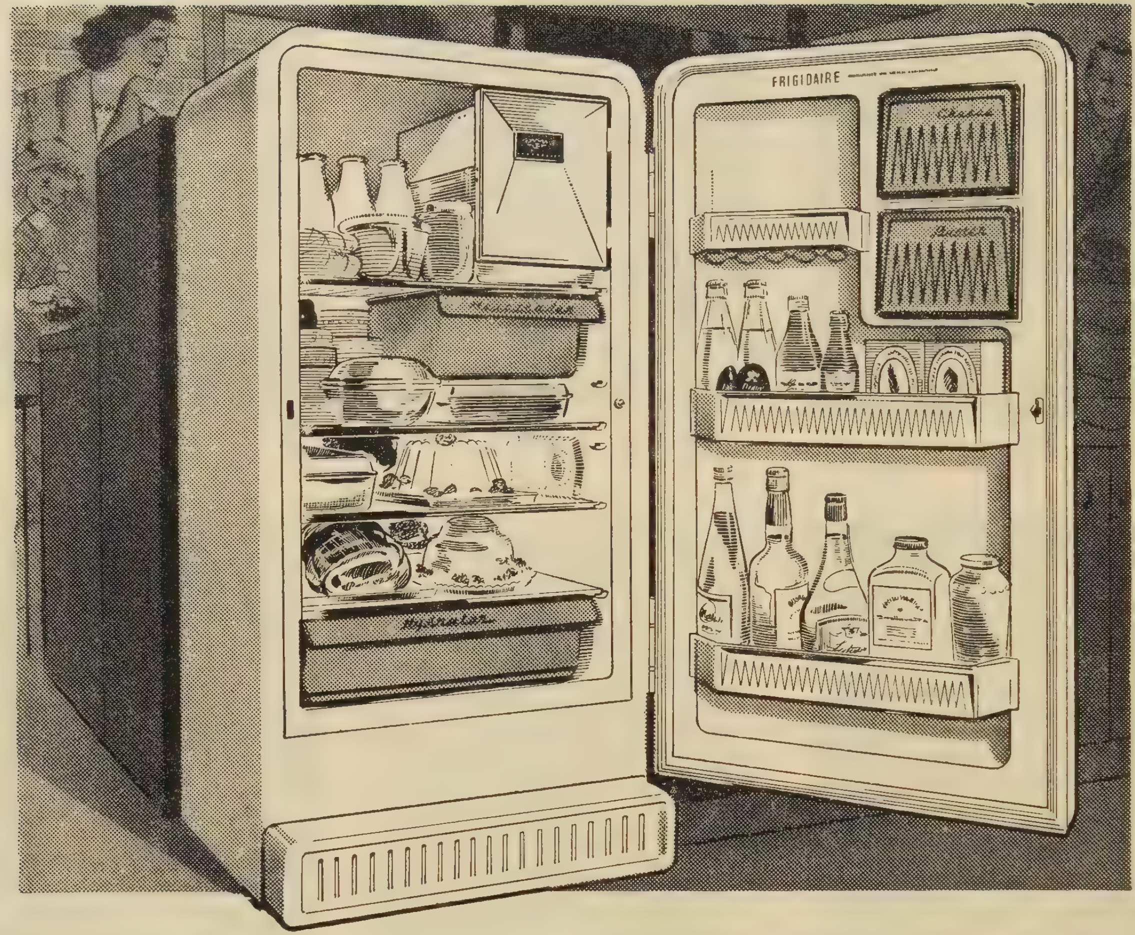
"Journal" "has been converted from a semi-scientific, semi-instructional publication into a journal of farm instruction providing a continuous flow of information in every branch of farming activity". They were unquestionably the "shot in the arm" so patently wanted and gave the magazine a new lease of life.

Toward the end of 1939 the "Journal", the printing of which had been taken over that year from the Government Printer by Blundell Bros. Ltd., was steadily heading toward the Department's objective of "a circulation of pre-eminence throughout the Dominion". The farming community's interest, which had flagged so noticeably in the doldrum period from the 1920s to the late 1930s, was being rekindled and advertisements were again being proffered freely.

Problems during Second World War

Just as these advances were being made the outbreak of the Second World War brought serious problems in the "Journal's" production. Shortages of manpower (both in the staff of the "Journal" and in the printing works), printing materials, and particularly paper raised difficulties which became more acute as the war progressed, but they were all energetically overcome by Mr Forde's successor, R. E. Owen, who was formerly advertising representative and who took over the editorship when Mr Forde was seconded for war duties as Private Secretary to a Cabinet Minister in 1942. Because of the vagaries of supply a mixture of paper had to be used for printing and some issues were cut back to 64 pages. Faith with subscribers was kept throughout the war and in

G. J. Neale, 1949-.



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The world's first choice, and no wonder, Frigidaire refrigerators are way out in front with the things that matter most. Bigger inside for less floor space, with the longest ever list of saving features, including the cheese compartment and exclusive Butter Warmer, and the handy Meat Tender now also on 6ft. models. There's a model designed with you in mind, available on most favourable trade-in terms. Proudest possession in any kitchen—a genuine Frigidaire refrigerator. Priced from £99.10.0.

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Distributed by Frigidaire Division of General Motors New Zealand Limited through a New Zealand-wide Network of Authorised Dealers.

*Over 23,000,000 Frigidaire refrigerating units built and sold

the years immediately following it; publication of every issue was maintained.

Increasing Farm Production

As in the First World War, New Zealand's responsibility as a major food supplier to the Allies was promulgated early after the declaration of hostilities and for the next six years the New Zealand farmer was exhorted to produce to the utmost. That he did so after the country had been drained of most of its young men stands today as a national achievement that lacks little of the lustre of the war effort of the Armed Services.

Among the various agencies used to encourage and help farmers expand their production to meet increasing demands from overseas the "Journal" had a prominent role. Not only did it offer guidance in the best farm management practices, but it gave advice on the conservation of farm equipment and machinery in short supply and in the use of substitutes for materials cut off through the war.

Aid for Britain Campaign

The end of the war did not bring an immediate return to normal. The grave economic position in which Britain found herself after six years of the conflict created a crisis in the overcoming of which all members of the Commonwealth had to share. New Zealand's part mainly was again increased primary production, and issues of the "Journal" during 1947 and 1948 continued to urge farmers to reach the targets set for all types of production by the Aid for Britain campaign. A measure of the response was that in 1948 the Dominion provided more meat for Britain than any other country in the world.

Still Brighter Presentation

Under the direction of Mr Owen changes in the presentation of articles in the "Journal" were being made to give neater and brighter layout of pages. Advertisements instead of appearing haphazardly through an issue were grouped as full lefthand pages to allow uninterrupted reading of articles; a higher standard of photography was sought so that better illustrations could be reproduced; art assistance was obtained to plan and prepare material for montage illustrations, for lettering, and to "touch up" photographs requiring strengthened outlines before blockmaking; a new contents page (at first on the second page of each issue and ultimately on the opening page) was used.

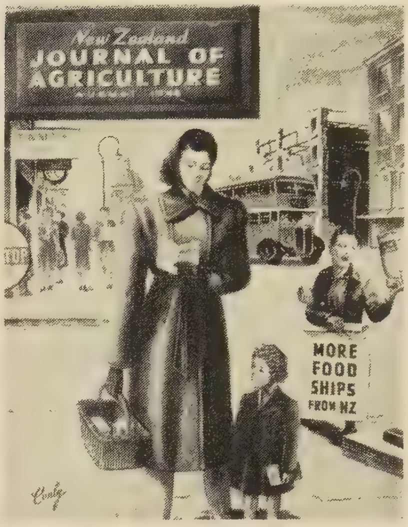
Covers, which during the early 1940s had carried colour advertisements, were replaced by reproductions of paintings by L. C. Mitchell, Allan Mitchell, M. Conly, J. Kenyon, Nancy Bolton, and other artists.

Catering for Women Readers

A small section for women readers about the farm home and kitchen which first appeared in 1938 was enlarged in 1941 to include "The Good Neighbour", by "Mary". These pages, which were contributed at first by Miss Mary Kitching and later by Mrs Enid B. V. Phillips, were popular for the cheery encouragement they offered and for the opportunity they gave country women of exchanging views and comments.

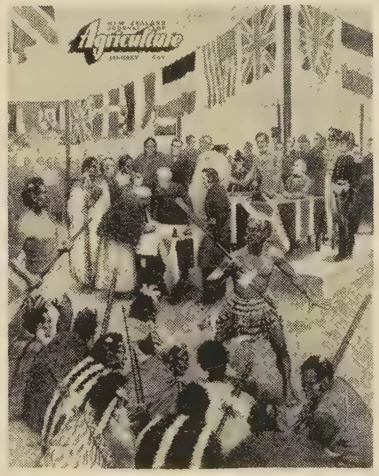
After "The Good Neighbour" had ceased to be published Mrs Phillips continued to contribute feature articles for the women's section, a series of which, "Royal Visitors to New Zealand", won the New Zealand Women Writers' and Artists' Society's Browning Cup in 1949.

With the establishment of positions in the Department for women extension workers in home science in 1945 the contents of the women's section began to alter as more emphasis was placed on home planning and management. Pioneer in this work and one of the greatest contributors of "Journal" articles for women readers was Mrs E. E. A. Topping, who in six years as a Rural Sociologist wrote on a wide range of subjects to advise the farm housewife in homecrafts and housekeeping.



Though the Aid for Britain campaign was not organised on a national basis until 1947, a succession of "Journal" covers from as early as 1945 kept reminding readers of the plight of the people in Britain and of the need for sending them all the food possible. Typical of this series of covers was that reproduced above, which was painted by M. Conly and which appeared on the August 1946 issue.

A Memorable Cover



Of the many scenes painted by L. C. Mitchell for "Journal" covers the most outstanding was probably that showing the signing of the Treaty of Waitangi. This appeared on the cover of the January 1949 issue, a month before the 109th anniversary of the signing, and involved the artist in considerable research to produce what is believed to be an authentic pictorial presentation of the scene. After printing of the issue the original painting was presented to the Waitangi National Trust and now hangs in the Treaty House at Waitangi.

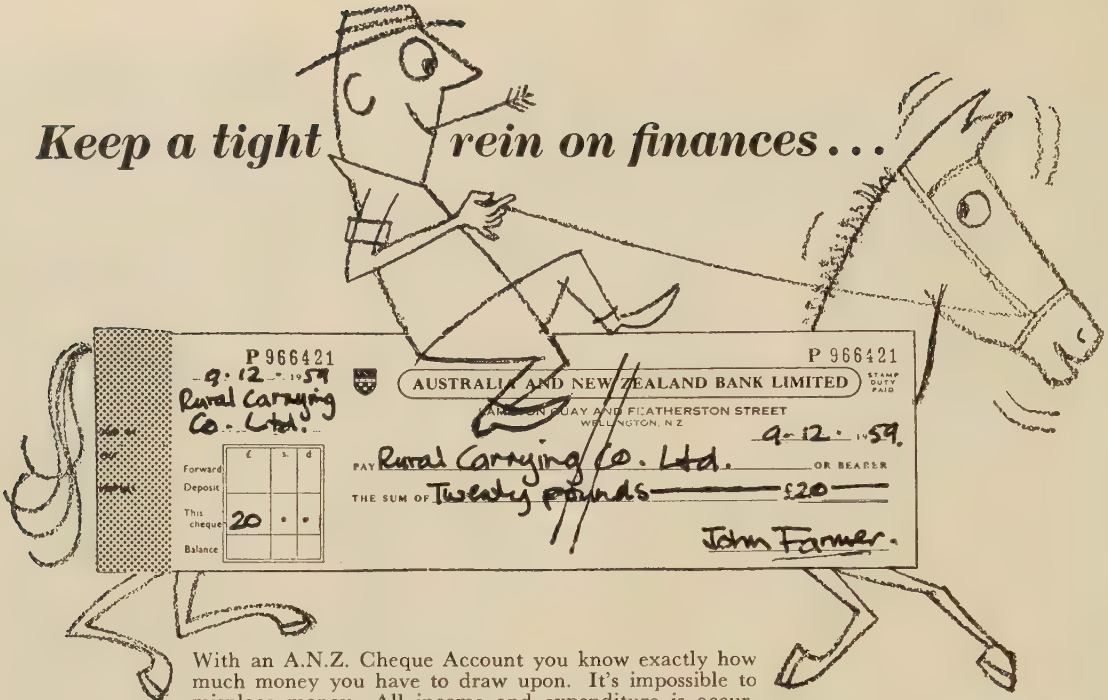
Many of these articles and others for women were printed lithographically by the offset process, which not only gave finer reproduction of photographs, but allowed wider scope in display and layout.

The section for the Federation of Young Farmers' Clubs, which had been included in the "Journal" for eight years, was discontinued in July 1946 and was issued first as an eight-page supplement to the "Journal" and then as a separate publication. This has now matured to a 32-page monthly magazine, "The Young Farmer", which is the official organ of both the Federation of Young Farmers' Clubs and the Federation of Country Girls' Clubs and of which 16,000 copies are printed.

The Circulation Tide Turns

The innovations introduced by Mr Owen were reflected in the spectacular rise in circulation which occurred in the nine years following 1942. At the beginning of the war the number of copies printed was 23,000, which fell away to 16,000 in 1942. By 1944 the circulation had returned to the pre-war figure, and then began to climb

(Continued on page 602)


Keep a tight rein on finances . . .

P 966421
9.12.1959
Rural Carrying Co. Ltd.

	£	s.	d
Forward			
Deposit			
This cheque	20	.	.
Balance			

P 966421
AUSTRALIA AND NEW ZEALAND BANK LIMITED
STAMP DUTY PAID
LAMBTON QUAY AND FEATHERSTON STREET
WELLINGTON, N.Z.
9.12.1959.
PAY Rural Carrying Co. Ltd. OR BEARER
THE SUM OF Twenty pounds £20
John Farmer.

With an A.N.Z. Cheque Account you know exactly how much money you have to draw upon. It's impossible to misplace money. All income and expenditure is accurately recorded by you and by the Bank, and the payment of accounts by cheque is so convenient. All A.N.Z. Bank Branches and Agencies offer a comprehensive range of services and you are welcome to call any time.

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102F

Important news to farmers with

BOOTH-MAC equipment

Pumps

FIGURE 18, 78 & 79
" 170 & 190 ASTON HEADS
" 200 Nos. 1, 2 & 3
" 300, 155 & SKIM MILK
" 400, 412, 360, 720, 720H & 1440
" 912, 931
" 500 READFLOW PUMP

C. W. F. Hamilton are able to supply all the full range of Booth-Macdonald spares. Don't discard machinery or pumps, restore and repair from C. W. F. Hamilton's full range of Booth-Macdonald parts.

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Tractor Side Rake.
Booth Drill, Grass Seed Box, Turnip and Rape Box.
8ft. Blade Terracer.
Star Feed Topdresser, MacAllister Topdresser Single & Double box.
Holland Walker Topdresser.
Integral Cultivator, Row Crop Cultivator.
Disc Harrows (Steel Queen & Steel King).
Massive Disc Harrows and Super Massive Harrows.
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Superb, Superior Plough (small stocks only).
Potato Planter, Dickhoff Drain Plough.
Carlyle, Sutton and Greig Flax Strippers.
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Please note C. W. F. Hamilton are not assembling complete pumps or farm machinery but only spare parts for the above.

C. W. F. HAMILTON & CO. LTD.
BOX 709, CHRISTCHURCH
(20 LUNNS ROAD, MIDDLETON).
Telephone 45-189. Telegraphic Address: Hydraulic, Christchurch.

H.38

Mechanical Production of "Journal"

The "Journal" is printed in sections of 16 and 32 pages on flatbed machines which work practically continuously in its production, for almost as fast as one issue is completed, the next is begun.

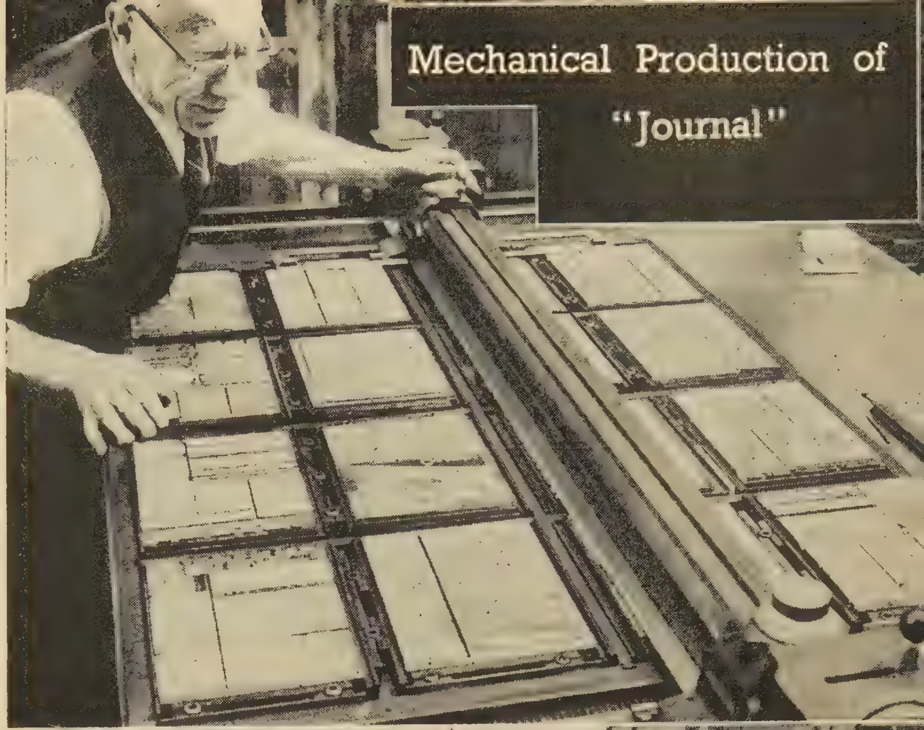
After manuscripts have been set in type by machine and the type has been made up into pages along with process engraving blocks (from which the illustrations are printed) the pages are assembled into a section of either 16 or 32 pages. This is divided into halves (so that front and back of the paper can be printed) and each half is locked up in a metal frame for placing on the printing machine.

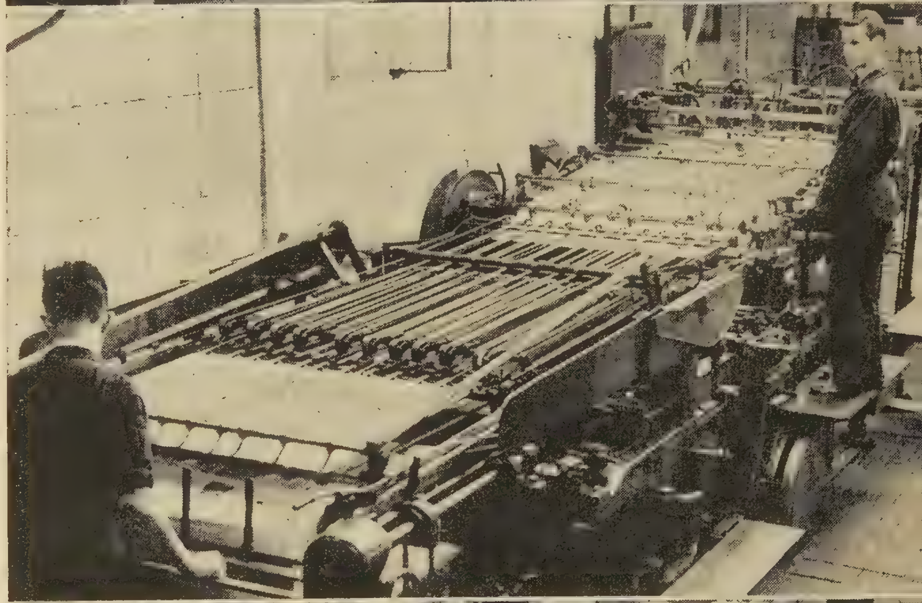
When all the different sections of an issue have been printed they are collated and bound together with staples and the cover is glued on. The illustrations at right show:

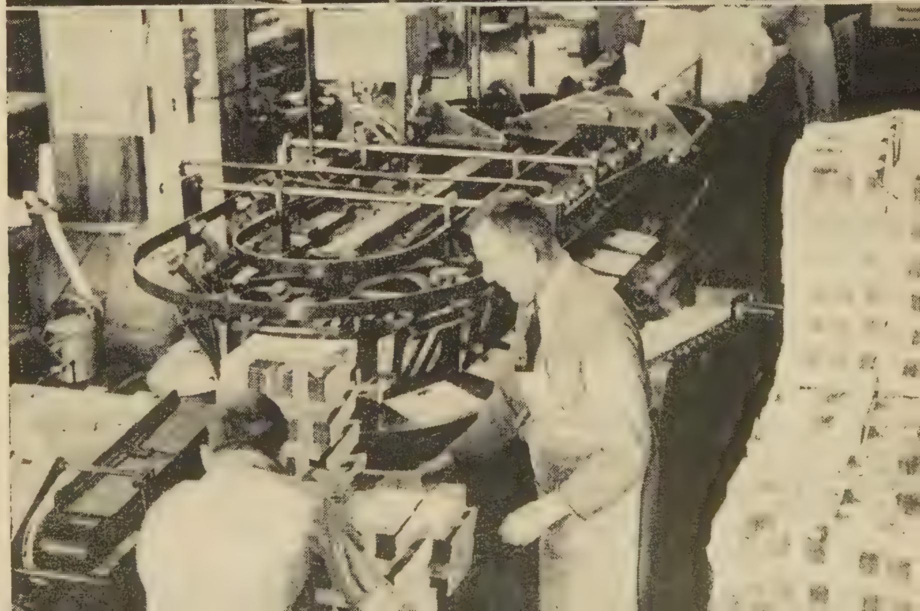
TOP—A compositor making final adjustment to locked-up pages before sending them for printing.

CENTRE—A flatbed machine printing one half of a 32-page section of the "Journal". Before printing the paper is trimmed into sheets of a standard size and these are fed singly into the machine, receiving an impression of type and blocks. The blank reverse side of each sheet is later printed with the pages in the other half of the section.

BOTTOM—Copies of the "Journal" being assembled from the different printed sections in the bindery ready for final trimming by guillotine. They are then wrapped and posted to subscribers.







A process engraver examining the details of a colour photograph while etching one of the four colour blocks which have to be made for the printing of the "Journal" cover.

First 50 Years of "Journal"

(Continued from page 599)

steadily beyond it. In July 1945, 40,000 copies were printed and in April 1946, 50,000. Two years later the circulation had passed 100,000, reaching a peak of 156,000 in June 1951. This printing run extended the capacity of the flatbed machines (and the dispatch arrangements) to the fullest and despite the employment of a night shift to keep the machines printing, the "Journal" was late in reaching some subscribers.

At such a high figure the circulation also imposed a considerable burden on production costs, and in the interests of economy it was decided in 1951 to raise the subscription rate for New Zealand subscribers from 2s. 6d. to 10s. a year; the overseas subscription was increased from 5s. to 13s. a year. This move had an immediate and continuing effect on circulation, which was deflated over the next nine years to its present figure of 58,000.

The Last Decade

The enormous strides science began to take under the stimulus of the Second World War and has maintained since have given agricultural research in New Zealand considerable impetus in the last decade or so. Appreciation of the need for more extensive experimental work has resulted in the establishment of five more research stations within the Department in the last 15 years, and the application on farms of new methods of management propounded by research workers and advisory officers of the Department has helped to push the Dominion's production levels higher and still higher.

In this period the "Journal" under the control of G. J. Neale, who succeeded Mr Owen in 1949 after the latter's appointment as Government Printer, has closely followed the Department's policy of keeping the farmer fully informed of the results of experimental work and of new techniques being evolved. Beside announcing and reporting on these developments, the "Journal" has also continued to press home the lesson of sound husbandry of the land and the animals carried on it.

Introduction of Colour Printing

The advances made in colour photography in the late 1940s allowed a new type of illustration to appear on the cover of the "Journal" and made possible the introduction of a colour section inside the publication. Over 100 colour transparency photographs of different sizes have been reproduced in four colours on the cover in the last 11 years. The high standard these covers have set in photography, blockmaking, and printing and their striking appearance have drawn much comment and many requests for copies.

The colour section inside the "Journal" started modestly as a four-page section of two pages in four colours and two in two colours on art paper in 1955, but was later expanded into eight pages, four of which were printed in four colours and the other four in two colours. Toward the end of 1957 all eight pages of the colour section were printed in four colours and a 16-page section formerly printed only in black and white was converted into two-colour printing. Unfortunately the use of additional colour in these 16 pages, which was particularly useful for the clear presentation of graphic material and maps, had to be discontinued in 1958 because of the need for Departmental economy.

The four-colour, art-paper section not only has had the advantage of realism in its illustrations in comparison with black and white, but it has allowed the illustration of features of technical significance not possible in black and white reproduction, for example, the indication of responses to fertilisers by the colour contrast between treated and untreated pastures and crops, leaf discolouration of crops symptomatic of deficiencies, identification of stains and other faults in wool, and the colour characteristics of weeds as an aid to identification. With the use of colour photography becoming wider today the range of subjects that can be treated in the four-colour section will assuredly be extended.

The first 50 years of the "Journal" now ended with volume 100 have placed on record 600 issues containing thousands of articles on divers matters concerning farming in New Zealand. Such a solid foundation stands to be built on, and whatever form good journalistic practice will dictate that it will have in future, "The New Zealand Journal of Agriculture" now seems certain to have become a permanent part of New Zealand's farming scene.

◆

"Journal" Subscription Rates

The "Journal" is issued monthly. The subscription within New Zealand is 10s. a year; the overseas subscription is 13s. (sterling). Subscriptions can be paid directly to any office of the Department of Agriculture, or the "Journal" may be ordered from any bookseller or newsagent. Individual copies are available from Publications Section, Department of Agriculture, P.O. Box 2298, Wellington, at 1s. a copy, post free.

Subscribers' inquiries (preferably accompanied by the address cut from a recent "Journal" wrapper) should be sent to the nearest office of the Department of Agriculture.

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"The Journal of Agriculture" is registered at the G.P.O., Wellington, as a magazine.

Farming 50 Years Ago

(Continued from page 527)

The need for the dairy farmer to pay more attention to the provision of winter feed was emphasised time and again, but the task of clearing a block of land of logs and stumps before it was broken up and a crop of turnips was sown often took years.

and now other grasses and white clover are appearing.

A number of different types of fertiliser were used, but the 1908 report by the manager of Ruakura stated:

> It is noticeable that basic slag as a topdressing produces the finer grasses and we find it a most suitable fertiliser for the lands of this district. A number of paddocks on the farm are now topdressed with basic slag; from 3 cwt to 4 cwt per acre is the quantity used; this is applied in May. Paddocks which have been so treated have produced herbage which must be seen ere the change wrought by this fertiliser can be realised. Throughout the long drought of the past season the paddocks topdressed with slag bore a green appearance.

Topdressing trials at the Department's other experimental farms at Waerenga, Moumahaki, and Weraroa were laid down about the same time and at Waerenga an analysis was made in 1908 of the increased production of grass from a group of plots to which various fertilisers had been applied.

A year earlier, in 1907, the manager at Weraroa reported on a similar investigation:

> Several experiments were carried out in topdressing with artificial manures, the paddocks being divided into four plots as follows: No. 1, special grass manure; No. 2, superphosphates; No. 3, not manured; No. 4, special grass manure. . . No. 2, superphosphate, giving the heaviest cut; it was of a rich dark colour, with a close bottom of clover. No. 3, not manured, was not only much shorter, but the amount of clovers did not show up, the cut being much less than any of the manured plots.

The reference to clover is particularly significant, as this was the factor which was to make topdressing of such value.

Prices Then and Now

Wholesale Prices

	1910	1960
No. 8 fencing wire	£10 per ton	£60 per ton
Cement	£3 13s. per ton	£11 10s. per ton
Heart rimu (undressed)	16s. per 100 board foot	£5 to £6 per 100 board foot
Woolpacks	2s. 4d. each	12s. 6d. each
Corrugated iron (7 ft sheets, 24 gauge)	3s. 4d. per sheet	16s. per sheet

Produce and Stock Prices

	1910	1959-60 season
Butterfat for buttermaking	10½d. per pound	32d. per pound
Wool	9d. to 11d.	45d. per pound
Fat lambs	Addington, February 1910, 13s. to 15s.	Addington, February 1960, £2 10s. to £3
Two-tooth ewes	Addington, February 1910, 12s. to 14s.	Addington, February 1960, £2 15s. to £3
Dairy cows c.t.p.	Westfield, July 1910, £6 10s. to £9	Westfield, July 1959, £35 to £45
Prime bullocks	Westfield, April 1910, £6 to £10	Westfield, April 1960, £50 to £53

Up until the 1920s the increases in carrying capacity and production which resulted from the wider adoption of topdressing are not easy to determine. In the Waikato, for example, land was still being brought into production between 1910 and 1920 and there was also a change-over from sheep to dairy cows. The following table sets out the numbers of total sheep and dairy cows in the two counties Waipa and Waikato in 1906, 1911, 1916, and 1921.

	1906	1911	1916	1921
Waipa County				
Total sheep	22,386	28 228	31,037	22,088
Dairy cows	9,805	13,541	17,090	28,660
Waikato County				
Total sheep	28,191	64,227	55,073	37,436
Dairy cows	9,505	14,371	20,207	36,149

Increasing Imports of Fertiliser

Between 1900 and 1910 imports of fertiliser increased steadily, though no detailed analysis is available until 1909. Total imports were 29,000 tons in 1900, rose to 75,000 tons in 1910, and passed the 100,000 ton mark in 1913.

Estimates of the total fertiliser available to farmers have also to take account of local production of blood and bone and small local production of rock phosphate. The following table shows the estimated quantities available from 1901:

	Tons
1901	46,000
1906	76,000
1911	109,000
1916	188,000
1921	218,000

The problem facing dairy farmers with pasture growth insufficient to provide enough feed is illustrated by a description of work on the Department's experimental farms in the annual report for 1910. It also shows how large a part annual crops played in the system of farm management.

> The maintenance of milk production during that part of the summer when the natural grasses fail is an important feature of experiment. . .
>
> In connection with the dairy herd, and important to all farm stock, is the production of roots—viz., mangolds, turnips, carrots—as well as rape and kale. For, while the lessening of the milk supply immediately manifests itself and appeals to all during the milking season, it is realised that the care of the cow during the winter is actually as important if the greatest return is to be secured; hence attention is devoted to the production of crops for use when she is not in milk.

For this latter purpose the report recommended mangels and kale. For summer feed, experiments were being carried on with maize, sorghum, and millet, and maize was held to be the most useful.

New Pasture Species

Stress was also laid on new pasture species:

> Two grasses of comparatively recent introduction may be mentioned—viz., *Paspalum dilatatum* and . . . *Phalaris commutata*. . . These are both of interest to the dairyman. The first is fairly well known; it cannot, however, be yet said if it should be placed among those grasses that are of high feeding value. This grass produces heavily during the warmer part of the year, and, although it may demand a longer rest during the colder season, it decidedly flourishes most luxuriantly when weather conditions are favourable.

The role that paspalum could play on dairy farms had also been emphasised two years earlier in the annual report for 1908.

> Several of the Inspectors report *Paspalum dilatatum* as doing remarkably well in their respective districts. One case is noted of a farmer in the Whangarei district feeding thirty milking cows on a 10-acre paddock during the dry month of January. . . . It is sown as a mixture with other grasses, and on poor country it does better than any. It showed to great advantage in the past dry summer, when the other grasses were burnt up.

Another inspector's report from North Auckland declared:

> This grass is coming into favour in the north and is proving of great advantage on the poor hill country and sour gum swamps where others fail. It is readily eaten by stock. On the better class of country it does not appear to advantage, making a very rank growth, and stock do not care for it in this state.

Though the Department was stressing the importance of adequate winter feed beside advising the use of lower fertility demanding grasses, many dairy farmers were not absorbing the idea. In 1908, again, a report from the Taranaki and Manawatu districts regretted this fact.

> The important question of providing winter feed other than grass paddocks for dairy stock is sadly neglected in many parts of the district, in some cases is almost criminally so. Inspector Fleming deplores the lack of winter feed in the Manawatu district. From Wanganui northward the question is getting more attention, and each year shows an increase in the quantity of hay and ensilage saved; but in the southern end of the district very little is done in this line, and the pitiable condition of many of the dairy herds in spring speaks for itself.

The difficulties North Island farmers faced in growing supplementary crops have already been mentioned. Inadequate pastures made it equally difficult to save sufficient hay.

One of the reasons for not making more hay was mentioned in a report from Ruakura in 1906. The manager expressed his satisfaction at the larger supplies of hay that had been made and listed new equipment the farm had bought, including a side-delivery rake or windrower, an improved hay sweep, two low-sided wagons, and a hay loader. "Of these, the rake or windrower is the most valuable." He added: "It is generally recognised that meadow hay, in most seasons, is difficult to save and that the labour of handling it is costly."

Annual Crops

The total area in annual crops in 1910 was approximately 1,750,000 acres, of which wheat comprised about 300,000 acres. Over the previous decade the area in crops had been rising, for though the area in cereals had been showing a downward tendency (the 300,000 acres of wheat for 1909-10 was considerably above the average), the area in rape and turnips was increasing, reflecting the expansion of the fat lamb industry.

Cereal yields during the decade 1900 to 1910 showed a great improvement over those for the previous decade, the better system of crop rotation playing a big part in building up fertility, though the use of superphosphate with wheat was still comparatively rare in 1910.

Wheat usually followed rape and this meant, too, that the land was in better condition.

The export trade in cereals was a fluctuating one, but in the decade before 1910 a fairly steady decline took place for both wheat and oats. In 1908 less than 1,400 bushels of wheat was shipped abroad; a better season the next year resulted in exports being 1,400,000 bushels.

High freight rates, competition from the expanding industry in Australia, the improvement in fat lamb prices, and the extension of dairy farming on to some of the heavier land in the South Island all had an effect.

The table following shows the area devoted to annual crops for the seasons 1900-01 and 1910-11.

	1900-01 (acres)	1910-11 (acres)
Wheat for threshing ..	206,465	322,167
Wheat for other purposes	1,619	14,222
Oats for threshing ..	449,534	302,827
Oats for chaff, hay, or silage and green fodder	191,507	290,569
Barley for threshing ..	30,831	33,491
Barley for other purposes	4,406	4,640
Maize for all purposes ..	15,751	18,857
Peas for threshing ..	5,888	14,829
Potatoes	28,524	29,023
Root fodder crops ..	411,674	465,041
Green fodder crops ..	124,318	208,057
Grain for hay and silage	68,023	62,600

The significant features of this table are the decline in the area of oats for threshing, though the 1900-01 figures are inflated by the demand at the time of the South African War, and the expansion in the area devoted to fodder crops, whether oats, turnips, or rape. There was practically no change in the area cut for hay.

System of Arable Farming in Vogue

A general picture of the system of arable farming in vogue was given in an article by F. W. Hilgendorf in the "Journal" for December 1914. At the time a good deal of concern was being expressed about the decline in the area devoted to wheat, a feeling that had been reinforced by the outbreak of war.

> In a country of the great range of latitude (34° to 47° S.) that occurs in New Zealand many varied

methods of agriculture are to be found. In the north maize is the most common cereal crop and in the south it is practically too cold for wheat. Further, by far the largest part of the country is in permanent grass and never comes under the plough. In these circumstances it is impossible to say what is the usual rotation of crops, but where the plough is used one of the commonest rotations is to break land out of lea that has been down about four years and sow turnips or rape. These are followed by wheat, then oats and grass seeds sown at the same time, and the resultant pasture allowed to lie for about four years again. Many variations are introduced—for instance, the land on being broken out of grass is sown in wheat, then oats, then rape and grass seeds mixed, and so back to the three to five years in pasture. Often, of course, a crop of mangels or potatoes takes the place of rape or turnips, and in some localities a crop of peas may come before the wheat; but the general rule is to have the land broken up for three or four years and occupied with root crops or cereals and then down in grasses and clovers for four or five years.

Treatment of the crops used in these rotations was discussed under the following heads:

(a) Grass.

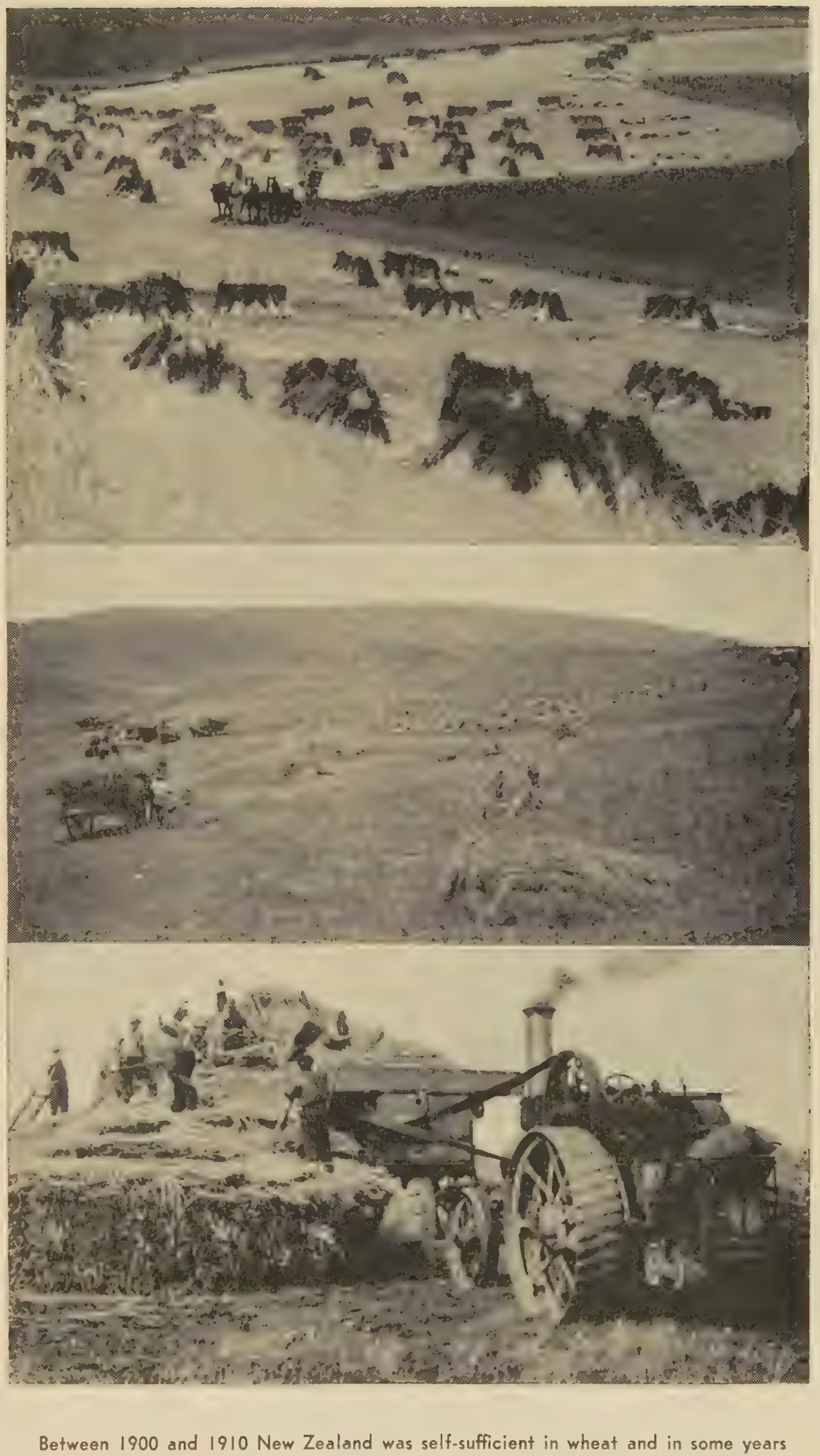
(b) Forage crops to supplement grass—
  1. In summer—rape, kale, silver beet, maize.
  2. In winter—turnips, oats, barley, wheat, hay, lucerne, mangels.

(c) Cereals, etc.—wheat, oats, barley, maize, peas.

(d) Potatoes.

Of forage crops, Hilgendorf wrote:

Rape.—About 250,000 acres are sown annually in all parts of the country from north to south. Land is ploughed either out of grass or the stubble of a preceding cereal crop and is got ready for seed in October or November—that is, early summer. On the better farmed land one would expect the ground to receive the following working: Plough out of grass in winter 3 in. or 4 in. deep; harrow in spring; plough again in late spring 6 in. deep; cultivate with spring tooth cultivator, then harrow. The seed is sown with a drill of colonial design. It has 13 or 15 coulters 7 in. apart, and the seed and manure are sown by force feed from two separate boxes at the same time and drop down the same tube into the ground. The rape is sown in 7 in. rows, about 2½ lb to the acre, and with it is sown the manure at the rate of 1 cwt to 1½ cwt per acre.



Between 1900 and 1910 New Zealand was self-sufficient in wheat and in some years had a surplus for export, but a year or two after 1910 farmers were complaining that there was little profit in wheat production. After cutting with the reaper and binder it was usual to thresh from the stook, but as farmers had to arrange the work according to contractors' rosters, the wheat was often stacked after two or three weeks until the traction engine and mill were available. Some farmers took great pride in the neatness and symmetry of their stacks.

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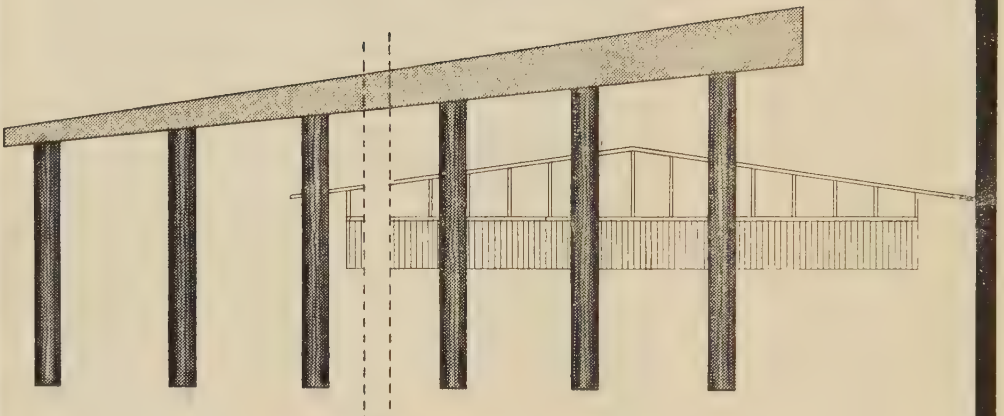

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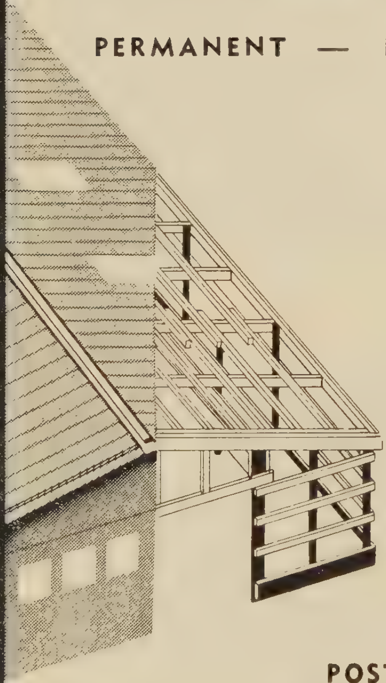

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> The manure is either guano (from the South Sea islands), superphosphate (from Japan) with about 40 per cent. tricalcium phosphate rendered water soluble, or a local freezing company's manure. . . . In December or January (i.e., midsummer) the rape is fed off by ewes and lambs or by newly weaned lambs, which are then sold fat to the freezing works. The rape is generally fed a second time by late lambs, although its quality is then poorer. On the lightest lands the rape may be left over winter and give a bite again in spring, but the land is usually winter ploughed for wheat. Rape is in dry districts and seasons often completely destroyed by aphis.
>
> Kale.—Thousand-headed kale is used to some extent to replace rape, but it is found to be very much less palatable, so that lambs do not fatten well on it. It, however, holds a great quantity of stock, and is hardly at all susceptible to attacks of aphis. It is sown 3 lb to the acre in October, with 1 cwt to 2 cwt of the previously mentioned manures, in rows 28 in. apart and is intercultivated once or twice during its growth. It is nearly always fed off two or three times in summer and autumn and not infrequently left till the succeeding spring. The stalks are considered a nuisance when cultivating for the succeeding crop. . . .
>
> Maize.—This is grown to a considerable extent in the dairying districts of the North Island to serve as feed for cattle. It is cut green and carted out to the cows when feed fails during the drier summer months.

Hilgendorf also referred to silver beet, which the Department of Agriculture had endeavoured to popularise a few years earlier. It is unlikely that much of it was ever grown for feed.

Dealing with winter forage crops such as turnips, Hilgendorf declared:

> About 500,000 acres of turnips and swedes are sown annually. Whether turnips or swedes are grown depends on the attacks of aphis and diamond-back moth and these in turn depend upon the rainfall. In general where the rainfall is below 30 in. soft white turnips are grown, Imperial Green Globe being the favourite variety. They are sown in December (i.e., midsummer) at the rate of about 12 oz. to the acre, in rows 14 in. apart on the flat and nearly always with 1 cwt of superphosphate. They receive no further treatment till about June (midwinter), when they are fed off by ewes or young sheep, the paddock being divided up into "breaks"—areas sufficient to hold the sheep feeding on them for about a fortnight. The grubber then raises the previously buried parts of the turnips, and the sheep after eating these up are removed to a fresh "break". The turnips are usually finished in August, and the land may be ploughed for rape or possibly for spring oats.

> In the wetter and especially the colder districts Aberdeen turnips are more largely grown and treated just as white turnips are. Where the rainfall is at or above 50 in. swedes are used. These are frequently sown in raised drills 28 in. apart and thinned and intercultivated so that very large crops result. The average yield of turnips and swedes is estimated at 16 tons.
>
> Oats for Green Feed.—A considerable though lessening area of oats is put in in the autumn to provide green feed for sheep in winter and early spring. These oats are usually put in on skim-ploughed wheat stubble at about 2 bushels per acre, without manure, and may be allowed to run to a crop, or if the feeding has been severe and late, will be ploughed in in the spring and the land sown with rape.
>
> Barley and Tares.—This mixture —or it may be oats and tares—is being increasingly used for winter feed. About three-quarters of a bushel of barley and three-quarters of a bushel of tares are sown in the usual 7 in. rows and usually with 1 cwt of superphosphate or other phosphatic manure. . . .
>
> Wheat for Green Feed.—In a wheat-growing area (chiefly Canterbury) the autumn-sown wheat is almost invariably fed off in early spring by ewes with lambs at foot, and a large bulk of feed is then incidentally obtained. . . .
>
> Mangels. . . . They are sown in October, 4 lb per acre, with 3 cwt to 4 cwt of local manures, including potash. They are sown on the ridge in wetter districts and on the flat in the drier ones; thinned and horsehoed. They are pulled and stacked into heaps in early winter, and then carted out into the grass-paddocks to cattle, or less frequently to sheep, during the winter months.

Dr F. W. Hilgendorf, of Canterbury Agricultural College, began work in 1909 on the selection of improved wheat varieties. His name is also associated with the first scientific analysis of the results of field trials.

Cereals in Arable Farming Pattern

Hilgendorf wrote of cereals in the arable farming pattern:

> The cereals occupy a somewhat less important place than do the forage crops in the general agriculture of the Dominion. They take up, however, practically as much land, but this is chiefly concentrated in Canterbury and Otago. They are not as universally distributed as are rape and turnips. . . .
>
> The most common varieties (of wheat) are Red Chaff or Hunters (not the English Hunters), Tuscan (of two varieties), and Pearl or Velvet. None of these are definitely connected with any of the European wheats from which they were originally derived. Resistance to wind is, next to yield, the most important quality in a New Zealand wheat. Wheat is sown usually in autumn or winter at the rate of 1 to 1½ bushels per acre, usually without manure or with 1 cwt of superphosphate. It is fed off in the spring, cut in February, and stacked in the field for a few weeks, or, as is frequently done, is threshed direct from the stook by contractors' travelling threshing plants and teams of men. The threshed grain is bagged and carted to a granary or more frequently stacked on a bed of straw in the field till time serves to cart it to the railway station for transport to the miller. . . .

> Oats.—Oats are sown in autumn or spring at the rate of 2 bushels per acre, invariably without manure. They are threshed from the stook or are stacked in the field where they grow, until wanted for chaff, when the sheaves are chaffed by travelling contractors' plants. . . The oat straw is stacked from off the elevators of the threshing plant, and as the three or four years' lea usually succeeds the oats, the straw is eaten by sheep or cattle grazing on the young grass in the succeeding winter.

Hilgendorf referred only to the areas of barley, maize, and peas and beans grown, but said a little more about potatoes:

> Nearly every farm grows a certain small acreage of potatoes and the total area planted varies from 25,000 to 40,000 acres. A few men make a specialty of this crop. The average yield is now about 6 tons, a reduction from the 8-ton average of 10 years ago, due largely to the incursion of the potato-blight occurring at about that time. Spraying and planting and digging by machine are adopted by only the larger growers, the majority being contented to risk the blight, to plant in the plough furrow, and to dig by hand. The favourite variety is Up-To-Date. . .

During the 19th century most of the wheat planted in New Zealand was either Pearl or Velvet, but from the 1890s Solid-Straw Tuscan took the lead and in 1910 accounted for about 70 per cent of the wheat sown. About 15 per cent was Hunters and about 15 per cent Velvet. Gartons was the principal variety of milling oats and Algerians, Duns, and Black Tartans were grown for grazing or chaff. Barley seed was very mixed, the main variety being Chevallier.

Degeneration of Seed

By 1910 the seed available had degenerated badly and this was a factor contributing to the decline in yields in the following decade. In 1909 Hilgendorf began his work at Lincoln on the selection of improved strains of wheat, but it was not until 1915 that a selection College Hunters was released commercially.

To control ball smut, pickling with bluestone was used and about 1910 formalin was introduced. A writer in the "New Zealand Farmer" for May 1910 declared:

> All seed should be dressed with formalin or bluestone solution as a preventive for smut. Neglect to do this frequently ends in disaster. Some growers imagine that wheat from another district will not go to smut; that the change is a sufficient preventive. This is an unsafe theory to work upon and in my experience has proved unreliable.

With the brassicas generally the outlook was by no means favourable. The 1910 annual report of the Department declared:

> The failure of the turnip crop is general almost throughout the Dominion. The present aspect shows that a most serious loss to agriculturists is threatened. The failure of this crop is brought about chiefly by the diamond-back moth and by bacterial diseases.

Reports from the experimental farms in the North Island also laid emphasis on the prevalence of club root.

Arable farming was based on the six-horse team. It was difficult, however, to carry out the range of cultivation required on a farm where the emphasis was on crop production without such a team, but if the team was to be kept fully employed, a very large proportion of a 360-acre farm, perhaps about 180 acres, would have to be in crops, a higher proportion than most farmers achieved in practice.

The complaints being made at the time that wheat growing was unprofitable could be related to the excessive capitalisation and high overhead costs which many farms were carrying because of the investment in a six-horse team. It was not until 1923, however, that any investigations were made.

Phormium

The Department did its best to foster the phormium industry, a "hemp grading" service having been introduced in 1901. The market was very unstable, exports being valued at £832,000 in 1907 and £306,000 in 1909, followed by a recovery to £448,000 in 1910.

The expansion in the production of manila hemp and more particularly the increased production of sisal in East Africa were factors in depressing

The base on which the management of a mixed arable farm depended was the six-horse team.

the price of the New Zealand phormium, but there were also complaints about the inferior quality of the New Zealand product. Many of the mills used inefficient equipment for stripping and this did not improve the New Zealand product's reputation. Mills adjusted their operations very rapidly in the face of the changes, and if prices moved in an unfavourable direction, they simply shut down.

The Department endeavoured to assist by establishing a grading service for fibre and attempting to make a selection of higher producing varieties, work along these lines being undertaken at Ruakura and Weraroa.

Sheep and Cattle

The following table gives a broad picture of New Zealand livestock farming in 1910, or rather in 1911, as a full collection of statistics was not made in 1910.

	1901	1906	1911
		Sheep	
Breeding ewes ..	9,906,616	10,479,187	12,324,463
Total sheep ..	20,233,099	20,108,471	23,996,126
		Cattle	
Cows in milk ..	372,416	517,720	633,733
Total cattle ..	1,256,680	1,810,936	2,020,171

SHEEP

Between 1901 and 1910 the percentage of breeding ewes rose from 44 per cent to 51 per cent as the fat lamb trade increased in importance.

In the North Island in 1910 sheep management and breeding practices were undergoing a change, but in the south things were more stable, the important developments having taken place a decade or so earlier.

Practically all the flock sheep imported into New Zealand in the early days of settlement were Merinos from Australia, though from the 1850s English breeds were imported also.

Influence of Lincoln

In the North Island, especially in the higher-rainfall areas, and this included much of the bush country, the unsuitability of the Merino was soon apparent, and during the 1870s and 1880s most of the sheep in the North Island changed character, the dominant influence becoming the Lincoln.

The Lincoln's possibilities had been discussed as early as 1850 by Frederick Weld in his "Hints to Intending Sheep Farmers", but then he had considered conditions too rough for the breed to thrive.

With the bringing into production of more and more bush country a change had to be made and while the initial fertility of the bush burn country remained the Lincoln proved the most suitable sheep. Lincoln rams were probably also the most readily obtainable in the North Island. The Lincoln clipped a heavier fleece than the other English breeds and its wool was less affected by charred logs and stumps.

On some of the larger properties the change-over took some time, Lincoln rams not being introduced at Guthrie Smith's Hawke's Bay property Tutira until 1888.

On other large properties such as Maraekakaho in the 1890s the flock would be predominantly of a Lincoln type, though based on a Merino foundation, but periodically Merino rams would be introduced to maintain a degree of fineness in the wool. This was probably the exception, however, for by the 1890s the bulk of the sheep in the North Island would be of a Lincoln type with a leavening of Romneys, mainly in the Wairarapa district and the Manawatu.

Some farmers, influenced by the success of the Leicester-Merino ewe cross in Canterbury, worked along similar lines in the north, but the Leicester type were not a success, the wool being easily pulled off in the bush burn country.

The Romney was recognised as being an active, hardy sheep, but there was a widespread belief that it clipped a lighter fleece than the Lincoln, and it was also believed that the wool was less uniform.

The prevalent attitude of mind in the mid 1890s was summed up in an interview published in the "New Zealand Farmer" for May 1895 with a leading sheep farmer, Hugh Campbell of Hawke's Bay. He looked at the Lincoln, the Romney, and the Leicester, agreeing that the Romney was a hardy, active type of sheep and adding that on certain classes of country it was no doubt a very useful breed, yet, without the infusion of a little Leicester blood occasionally, the Romney could "never be classed as a first-class sheep for freezing. As a wool-bearing sheep the Romney is not to be called a very heavy clipper. Most of them are both a little hollow and narrow behind the shoulders and rather narrow on the back. . . . The Romney has a good, hardy constitution and he is well suited for country that cannot be classed as the very best, as well as for bush country where there is a comparatively heavy rainfall."

Dismissing the Romney in that strain, the breeder went on:

> In the Lincoln we have the sheep which ought to be the foundation of every flock on high-class country. He is by far the heaviest clipper of any of our long wool breeds, and if rightly bred has a good constitution. . . . Let a sheep farmer put about one quarter of his ewes, selecting always those with the coarsest wool, to a Leicester ram, either English or Border as he may fancy, and he will have a flock of sheep that will carry him through, bad and all as the times are. His flock will give him a heavy clip, a good sheep for freezing, and his four-year-old ewes would fatten quickly after weaning his lambs, and that, too, without any forcing at all, while his wethers would be fit for market, off the shears, as four tooths on ordinary feed.

Lincoln's Weaknesses

Nevertheless the Lincoln was being subjected to strong criticism from two angles. It was suggested that it could not provide a type of carcass that was suitable for the frozen meat trade, and that hogget mortality, especially in cold, wet winters, was excessively high.

William Nelson, in giving evidence before a Parliamentary committee on the frozen meat trade in 1902, declared:

> . . . The difference between the best Canterbury sheep and our North Island sheep is entirely due to the breed, and in Hawke's Bay, the district I come from—and it applies chiefly to the whole of the North Island—our sheep have a Lincoln basis, a Lincoln sheep being admittedly a profitable sheep for wool, but a very bad sheep for mutton. In Canterbury, on the other hand, they have a high-class Merino crossed with some other breed —either with Leicester or Down sheep, but without a particle of Lincoln blood in their veins. It will be absolutely impossible for us to

Flock sheep in the North Island were often of a mixed type in the first decade of this century. This mob shows Romney, Lincoln, and English Leicester influences, but the effect of the rough conditions is apparent in some of the fleeces.

get such sheep, because we have to get rid of the Lincoln strain.

The unsuitability of the Lincoln as a mutton sheep was due to the fact that it was too long in the leg and the meat was not of an attractive texture. The lamb was also slow in maturing.

From about 1900 there also appeared a growing volume of criticism of the Lincoln's stamina. In 1903 the Stock Inspector at Wairoa reported that a number of sheep farmers had decided to give more attention to the hardier crossbred sheep and not drift too far into the Lincoln.

He reported:

> I notice during the last two years this has been adopted on several properties, the English and Border Leicester, and in some instances Romney, rams used in place of pure Lincoln, with the result that a strong, robust lamb is reared and that there is a much-reduced death-rate in the hoggets.

In the same year the Stock Inspector in the Rangitikei observed that in the Hunterville district "Lincolns have gone out of favour . . . and Romneys and Leicesters are taking their place".

The principal weakness of the Lincoln was the excessively high mortality among the hoggets. This was especially serious where feed supplies were limited. Where farmers were able to provide turnips for winter feed the problem was largely surmounted, but as pastures on the hill country deteriorated and as no supplementary feed was available, the Lincoln's faults were given full emphasis.

Rise of Romney

The Romney was brought to New Zealand in 1852, a flock being established on a farm owned by Alfred Ludlam at Waiwhetu in the Hutt Valley. Two years before Ludlam's death in 1877 the flock was sold, the purchasers including a number of prominent runholders in the Wairarapa. Among them was Alfred Matthews, Edward Riddiford, and Charles Pharazyn.

Some others went to the Manawatu, where the buyers included Major Willis of Greatford and William Akers of Opiki. For a good many years Romneys did not spread very far beyond these districts, but the influence of stud properties such as Waiorongomai in the subsequent development of the Romney has been very marked.

All accounts suggest that the Romney was a very active sheep and able to stand up to much harder conditions. In general the fleece was markedly lighter than that of the Lincoln, but the Romney was a better sheep for the meat trade, the ewe was a better mother, and the lamb was quicker in maturing.

As far as the individual farmer was concerned all these changes were made fairly gradually and in the decade before 1900 most North Island sheep would be a Lincoln-Romney cross. This proved a reasonably adaptable animal. This cross was maintained at a certain level of uniformity by mating each year the coarse-woolled ewes with Romney rams and the finer-woolled ewes with Lincoln rams.

The table below shows the breed situation in New Zealand between 1901 and 1921, when the change-over from the Lincoln to the Romney took place.

Romney and Lincoln rams were about equal in numbers round 1905, the decline of the Lincoln and the rise of the Romney proceeding at equal speed; the other breeds were not of great significance in the north except that the increase in the numbers of the Southdown was associated with the rise of the fat lamb trade.

Breed Changes in South Island

In the South Island breed changes proceeded along rather different lines. As late as 1890 practically all the large flocks and a fair proportion of the smaller ones were Merinos, though as the country was developed and subdivided the Merino's faults became more conspicuous.

From the 1890s and with the development of the meat export trade many runholders turned to a half-bred flock, but here the difficulty was to maintain such a flock without

NEW ZEALAND BREEDS OF RAMS, STUD AND FLOCK

	North Island						South Island					
	1901 Rams	% of Total	1911 Rams	% of Total	1921 Rams	% of Total	1901 Rams	% of Total	1911 Rams	% of Total	1921 Rams	% of Total
Merino	5,259	4.6	5,716	3.6	1,045	0.6	24,293	24.1	16,281	11.8	11,638	8.0
Lincoln	71,274	62.3	38,336	24.0	23,949	13.7	9,781	9.7	3,596	2.6	2,550	1.7
Romney	22,255	19.4	87,487	54.8	129,767	73.8	11,889	11.8	25,739	18.6	45,136	30.9
Border Leicester	2,744	2.4	5,815	3.7	1,826	1.0	17,698	17.5	32,651	23.6	24,125	16.5
English Leicester	6,173	5.4	7,342	4.6	1,293	0.7	22,154	21.9	33,638	24.3	24,004	16.4
Southdown	1,794	1.6	8,939	5.6	15,888	9.0	1,361	1.3	1,728	1.2	2,199	1.5
Corriedale	—	—	—	—	878	0.5	—	—	—	—	16,114	11.0
Other breeds	4,964	4.3	5,947	3.7	1,247	0.7	13,820	13.7	24,686	17.9	20,485	14.0
Total rams	114,668	100	159,579	100	175,893	100	100,996	100	138,319	100	146,251	100

moving too far in any one direction. This called for a high degree of skill and patience, as the objective was to maintain a flock which clipped a fleece in the 56 or 56/58 class.

Some runholders obtained the best results by using two pure sires (Merino and Lincoln, English Leicester, or Romney) on a carefully culled and graded ewe flock. Some turned to the Corriedale ram and bred back consistently to him. Others preferred to use the first-cross half-bred ram, usually the progeny of Lincoln, English Leicester, or Romney rams from Merino ewes. Around 1910 many of the larger properties were being subdivided and to widen the demand for the sheep at dispersal sales the owners often switched over a portion of their flock in the year immediately before to first-cross half-breds.

In 1910, however, the Merino had not lost a great deal of ground compared with 10 years previously, but the Lincoln was declining rapidly. The Romney, the English Leicester, and the Border Leicester were all increasing, though the last two were to lose ground in the decade after 1910.

The Romney was well represented in Southland and South Otago, but was not very common further north.

Canterbury lamb was based on the progeny of an English Leicester ram and a half-bred ewe and its success in the British market up to 1910 did not encourage breeders to depart from it.

Further south the Border Leicester was a popular fat lamb sire, but the production of fat lambs in Southland and Otago was much less than in Canterbury.

Southdowns made practically no progress in the South Island between 1900 and 1910 and very little in the next decade also.

In the years before 1910 a prolonged controversy resulted in the Corriedale being accepted as a sheep of a distinctive breed. The numbers of Corriedale rams in 1910 are not available, the first reference being in 1918, when there were 13,152, 91½ per cent of which were in the South Island. The breed's home was in North Canterbury and it spread to the larger estates or the subdivisions of larger estates which had previously run half-breds or Merinos.

Demand for Breeds in 1910

The demand for particular breeds in 1910 is shown in an analysis in the "New Zealand Farmer" for November 1910 of the changes in the number of sheep recorded in the 1909 and 1910 issues of the Flock Book. The writer noted that the total of breeding ewes in the South Island increased in a year by 5,000 or approximately 6 per cent.

He added:

> The flock book is the best gauge as to what breed is the favoured one, as breeders will not produce animals for which there is not demand. Some seem to think it is the studmaster that popularises a breed. It is no such thing. The man that breeds for general utility makes the market for the breed that he finds possesses the qualifications to suit his needs. Therefore, judging on these lines, the Border Leicester seems to be the favourite, the ewes having increased by 11 per cent and the rams by 16 per cent. The English Leicesters are in larger numbers, but have only increased 6 per cent in ewes and 7 per cent in rams. The southern part of the Island is the stronghold of the Borders and the northern of the English. The Romney is also making fair headway, more especially in Southland, gaining 18 per cent in ewes and 13 per cent in rams. Lincolns seem to be barely holding their own, except that there seems to be use for 246 more rams. The Southdowns are having the best of the Shropshires, for, although the latter are double in number, they show no increase, whereas the Southdowns have 10 per cent in ewes and 13 per cent in

▼ Stock sales have always had an important place in New Zealand farming. At this well attended sale in Taranaki two Shorthorn-type heifers are coming under the auctioneer's hammer.

Though the walk-through shed was being widely adopted, some farmers still built substantial structures that were dark, airless, and very difficult to keep clean.

rams to their credit. Merinos also are on the down grade. With regard to the Cheviots, Ryelands, Oxford Downs, and Dorset Horns some may consider that as they are so limited in numbers, the space could be better occupied, but one reason why they are included is that the table would not be complete without them; and a better reason still is that one or all of them may be the favoured breed 50 years hence.[!]

Let us now see what is happening in the North Island. The Romney is here still a long way ahead as regards numbers and is increasing at the rate of 8 per cent in ewes and 13 per cent in rams. But the Lincoln is again on the up-grade, and after a decade of neglect, is now being inquired after, and as regards demand (judging by production) is on a par with the Romney, the increase having been 13 per cent in ewes and 11 per cent in rams. Should breeders continue to add strength to their constitution as they have done while under a cloud, they will find territory open in the North Island for them.

Leicesters are not made much use of in the North, except as fat lamb getters, and, of the two, the Border is gaining ground rapidly on the English. The latter show a small decrease, while the Border has increased by 20 per cent in ewes and 28 per cent in rams. The Southdown is also making wonderful strides, the increase being 22 per cent in ewes and 26 per cent in rams, so that the race is now between the Border Leicester and the Southdown. The Shropshire is losing caste in the North as well as in the South, for what reason no one appears to know, as they are good mutton sheep.

There is only one flock of Merinos left in the North—that of Mr W. T. Birch, of Erewhon, Hawke's Bay.

CATTLE

No statistics of dairy or beef breeds are available until 1918, but it is generally known that before 1914 the greater proportion of the cattle, both beef and dairy, were Shorthorns. This was not regarded favourably and considerable stress was being laid on the importation of pedigree animals from abroad.

Early Fat Lamb Trial

INFORMATION about a trial with rams as fat lamb sires at Moumahaki over several years was made available in 1910. This, one of the few animal production trials undertaken on the experimental farms at the time, showed that the Southdown was the most rapidly maturing lamb, followed by the English Leicester, Shropshire, and Border Leicester in that order.

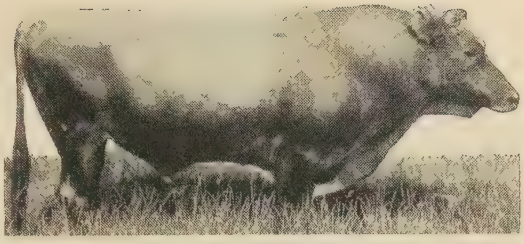
The Jersey had always been a popular breed in Taranaki and its numbers grew with the expansion of dairy farming in the Waikato. In the South Island, which was relatively much more important in dairy farming in 1910 than it is today, the Ayrshire had a large following.

The Jersey Cattle Breeders' Association was formed in 1902, the Ayrshire Cattle Breeders' Association in 1909, the Holstein-Friesian Association in 1910, and the Milking Shorthorn Association in 1913.

Ascendancy of Jersey

The gradual ascendancy of the Jersey was due to three chief causes—its early maturity, its high butterfat production, and the wise use of pre-potent butterfat bulls in the formative period of the industry.

The early advance of the breed was largely due to the productive capacity of the progeny of two English-bred Jersey bulls—K.C.B. and Silver King—imported in 1902. K.C.B. was registered by George Gould, a Christchurch breeder, and Silver King by James Stuckey of Opaki near Masterton. Both breeders interchanged the services of these two bulls and it was when mated with the daughters of Silver King that K.C.B. produced some of his best stock. K.C.B.'s influence in raising the production of Jerseys was continued by his son Grannie's Knight. The influence of K.C.B. remains of considerable significance even today.



Imported in 1902 from Britain, K.C.B. had an important influence on pedigree Jersey herds about 1910 and for many years after.

In 1908 Eminents Fontaine was imported from the United States and the same year Majesty's Fox was brought from the island of Jersey. Two years later Soumise Majesty was also brought from Jersey by the noted sheep breeder Charles Goulter of Blenheim.

During the same period some notable importations of Friesians were made from Canada, including Burkeyje Sylvia Posch, imported in 1913.

The Department of Agriculture imported a number of pedigree cattle in the decade before 1910, but without any particular success. At Moumahaki an unsuccessful attempt was made to popularise the Dexter-Kerry breed.

Estimates prepared by the Dairy Board in 1943 show that the average production per cow in 1909-10 was 148 lb of fat. The "New Zealand Farmer" for November 1910 reported that the secretary of the Riverdale Dairy Company in Taranaki, which had 47 suppliers, had worked out that the best producer supplied 16,700 lb of fat from a farm of 94 acres or an average of 177 lb per acre. The poorest supplied 14,410 lb of fat from 271 acres or an average of 53 lb per acre. No average was worked out, but 22 producers or nearly half the total suppliers managed over 100 lb per acre. This would probably be a much better performance than most districts attained.

The beef breeds in 1910 were almost entirely Shorthorns and Herefords, the Aberdeen Angus being very little known, though some had been imported as early as 1868. Frozen beef did not fetch a very high price overseas and the practice of using beef cattle as cultivating implements was not so widespread, though they were certainly important in back country and in some districts such as North Auckland. Stud Herefords had been imported by Sir George Whitmore of Clive Grange in Hawke's Bay, James Stuckey, and Every McLean of Auckland.

Wages in 1910

With Board

Farm labourers, 20s. to 30s. per week.

Ploughmen, 25s. to 35s. per week.

Shepherds, £60 to £80 per year.

Shearers, 20s. per 100.

Without Board

Carpenters, 10s. to 12s. per day.

Painters, 10s. per day.

Introduction of Herd Testing

A great deal of stress was being laid at the time on the value of herd testing and in the years immediately before 1910 many suggestions were made that New Zealand should follow the example of a number of European countries, more particularly Denmark, and introduce a system along similar lines in New Zealand. One of the strongest advocates was Joseph George Harkness, secretary of the National Dairy Association, and at the 1909 conference of agricultural societies he spoke strongly in favour of some action being taken. At the same meeting the Dairy Commissioner, David Cuddie, estimated that it would be possible to increase output by about 25 per cent by the elimination of poor producers and he added that the Department planned to make a start with 500 to 600 cows and thus awaken interest among farmers.

The Department's annual report for 1910 devoted considerable space to the inauguration of cow testing, and the early issues of the "Journal" contain many articles by W. M. Singleton on the subject. The 1910 annual report declared:

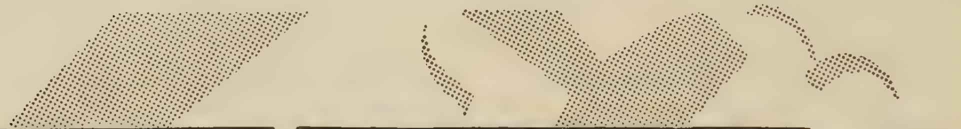
> The importance of cow testing has long been recognised by officers of the Dairy-produce Division and during the last five or six years we have been endeavouring to encourage the practice. . . . Although during previous years the head of this Division has been recommending the commencement of cow testing work by the Department, nothing was authorised until last spring, when the Hon. Minister approved of the proposal to start a cow testing association at Dalefield. The suppliers of this factory were met at their annual meeting on 21 August in Carterton and after our proposal had been outlined and the advantages of and the necessity for such an association had been explained, suppliers representing almost 700 cows handed in their names. These figures were afterwards supplemented by some other suppliers who had not attended the meeting, but joined later. In all 815 cows have been tested during the season.
>
> A start was made with the actual work in September. Four consecutive milkings were weighed and sampled by each member about the middle of each month. The sheets on which the weights had been recorded were sent to the factory with the samples. The test was recorded opposite the number of each cow in the respective herds and the sheets forwarded to the Division's head office, where the computations were made. . . . The beneficial effects of testing were expected to accrue (1) through the dairymen ascertaining definitely what cows were unprofitable so that the average production of the herd might be raised through such poor producers being discarded; and (2) through the dairyman ascertaining his best producers, and, by breeding these to a good sire, raising the standard of the productive capacity of the herd through the replenishing of the herds by these heifers of improved strain.

Other more indirect beneficial effects were also expected, such as creating incentives to better breeding, better feeding, and better care of the good cows.

Noxious Weeds

After a resolution regarding noxious weed control had been adopted by a conference of representatives of agricultural and pastoral societies in 1892, the Government regularly introduced a Bill into the House. There was, however, a good deal of controversy as to what powers should be vested in a Government Department to control noxious weeds, what role local bodies should play, and which weeds were really dangerous. Counties already had power to compel owners of land adjoining public roads

There's no 'safety in numbers' for thistles sprayed with . . .



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to destroy noxious weeds, but few counties had exercised it or were willing to do so.

Each session a new draft Bill was brought forward, but it was never given any urgency, being regularly referred to the Agricultural and Pastoral Committee for further consideration, with the result that it was not proceeded with.

The main points at issue were the extent to which responsibility for the suppression of weeds should be shared by the Government and local bodies, the administration of the Act, and the actual weeds that should be scheduled. The Act, as passed in 1900, was the result of a series of compromises. It received general support in Parliament, though a number of members expressed concern at the arbitrary powers that would be placed in the hands of inspectors.

The new Minister of Lands, Thomas Young Duncan, when introducing the Bill, declared:

> Now, if a Bill such as this . . . had been passed ten or fifteen years ago . . . there would be very few farms at the present time that would be troubled with the weeds. However, through the neglect in causing the seed to be cleaned properly, the weeds have spread and are now spreading, and they will keep on spreading until the House passes such a measure as this.

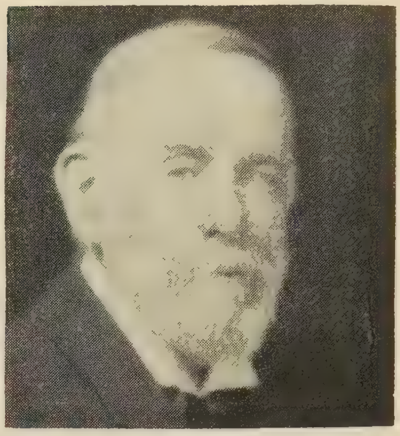
The 1900 Act provided that there should be two schedules of noxious weeds. The first schedule listed blackberry, sweet briar, and Californian thistle, and responsibility for ensuring that these weeds were suppressed was placed in the hands of the Department's inspectors. A second schedule listed a number of weeds, responsibility for the suppression of which was placed in the hands of local bodies if they decided to adopt the schedule. Another section of the Act dealt with weed seeds in grass seed.

Preserving Reasonably Clean Country

By 1910 it was realised that legislation alone could hardly rid the country of noxious weeds, though it might check their spread. In 1909 the Minister of Agriculture, addressing a conference of agricultural societies, declared it was his Department's line of action to preserve the reasonably clean country and do the best they could with the other country.

The Department's annual report for 1910 put the position in a sober light and drew attention to the time that would be needed to combat weeds successfully:

> The control of weeds is probably one of the most difficult problems that can possibly be set out for satisfactory administration. These weeds had established themselves so generally throughout the whole of the Dominion before legislation was provided that it is unreasonable to expect an immediate improvement over any large extent of country.
>
> The general expressed desire of the country is decidedly in favour of effective suppression. This demand has been strenuously exhibited by important associations and by many local authorities. Of the former, the conference of delegates of Agricultural and Pastoral Associations was particularly emphatic in the recommendation that effective repression should be asserted; and of the local authorities many County Councils are insistent in the same direction. This is to be accepted as more than an intimation that the action of the Department in the past should have been more vigorous. It is the mandate that warrants the prosecutions that are being undertaken and that must be continued to assure the effective control that is so clearly demanded. It is trusted that the officers administering the Noxious Weeds Act will receive the support and co-operation of those who ask for active methods of repression, now that these measures are in operation. It is fully recognised that associations and local authorities enunciate these views in a strictly impersonal sense, and it is found that very serious modifications exhibit themselves when, as occasionally occurs, the coercion applies itself to the denunciating individual, or even when several prosecutions are instituted in his district. It is here that the support would be valuable and very keenly appreciated by the officers whose duty it is to conduct these operations. . . .
>
> The general condition as regards weeds is that in very many localities useful work has been effected, and that on agricultural lands this is already clearly shown. Improvement is not so generally noticeable in grazing and pastoral districts; and where the blackberry has obtained a place on timbered lands owners are reluctant to attempt the slightest control.



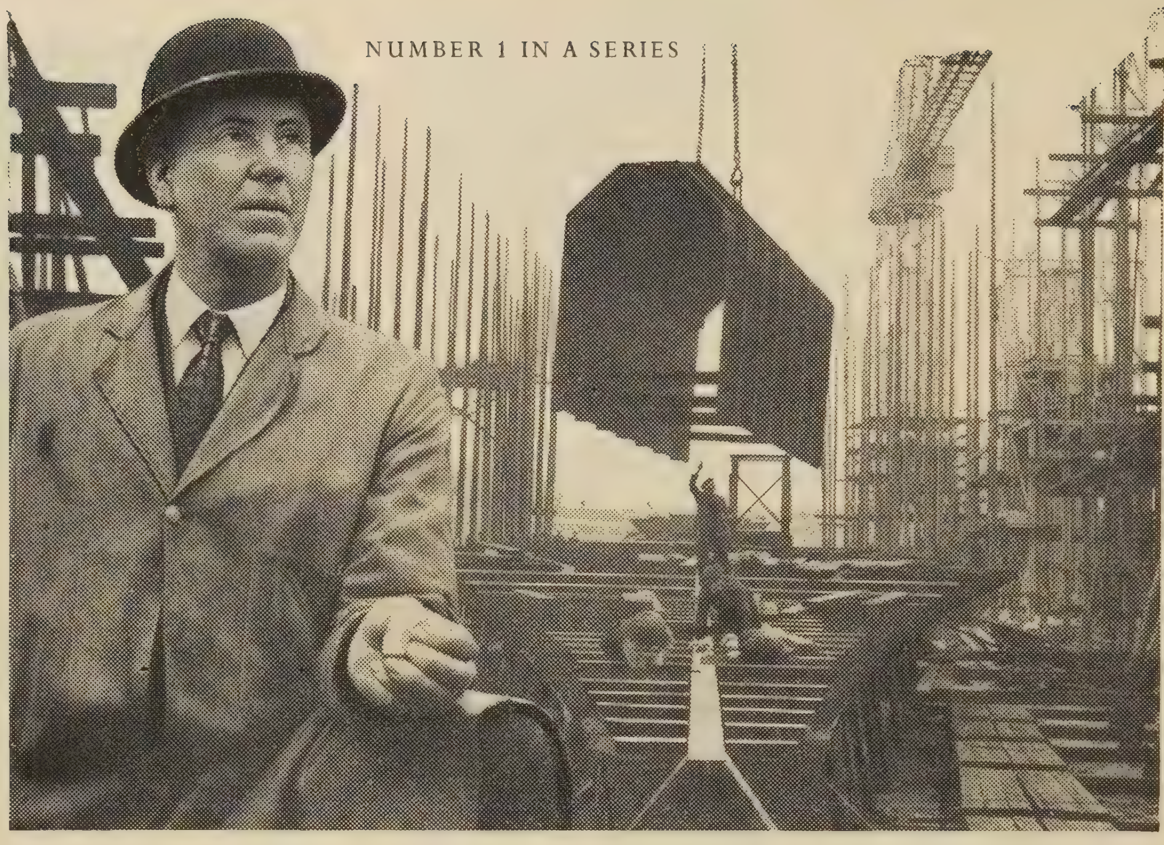
[S. P. Andrew

Thomas Young Duncan, who followed Sir John McKenzie as Minister of Lands in 1900. He introduced the Bill which was passed as the Noxious Weeds Act in 1900 and continued the policy begun by Sir John McKenzie of encouraging closer settlement.

> The season, as usual, is prolific in proprietary specifics as weed destroyers. The claims of the proprietors, when put to the test, have not, however, satisfied the Department. Some of these preparations are fairly effective, but at a cost that is prohibitive; many are dangerous to stock; the effect of some is that the land is unfit for other plants for a long period; and there is one at least that has the advantage of containing for its chief ingredient that most invaluable nitrogenous fertiliser, nitrate of potash, though the value of this specific as a weed destroyer is extremely problematic.
>
> The experience of the past will show that there is not yet a royal road to extermination of injurious weeds by the simple application of any of these preparations. It still remains that careful and repeated cultivation is the radical exterminator, and repeated cutting or grubbing affords the only relief for grazing or pastoral properties.

No serious investigations into the problem of noxious weeds had been made by 1910 and in the light of the state of knowledge and the state of farming practice there was not very much that could be done. The larger area in cereals, particularly oats, made it almost impossible to control Californian thistles and effective control of weeds in pastures was not possible until they were suppressed by the competition of stronger growing pasture species such as perennial ryegrass.

NUMBER 1 IN A SERIES



The man with the answers

Take a New Zealand farmer and set him down in the 'old country' among his seldom-seen relatives—and you have the makings of quite a party. Fred Mackenzie made that discovery within ten minutes of his arrival at the home of his brother-in-law, Alf. But Alf isn't only a good host; he's now Chief Officer on one of the ships which serve New Zealand and he can't keep away from ships for long. So, one fine morning, he took Fred down to a yard where a new 10,000-tonner for the Lines was in the early stages of construction.

Fred was very impressed. "But," he said, "to a landsman like me, it's all rather confusing. What, for example, is going on *there*?" "We'll soon find out," replied Alf. "Let's meet the man who knows the answers".

There were, in fact, two of them: a tough-looking character called Ken Lockerbie, manager of the slipway, and a Senior Officer of the Line who held a watching brief over the whole project.

Fred learned that the ship had no name as yet; she was just No.1290 on Slip No.4. He learned that although one of the Lines was paying well over two million pounds for her, they didn't yet own her; the builders did and would do, until after the trials. He learned that what he thought were 'ribs' were in fact called floors—and they weren't floors at all, but the members to which the frame (which most people call 'ribs') would subsequently be attached.

By now slightly dazed, Fred wasn't surprised to hear that the great steel 'shed' which was swinging airily from a crane, wasn't a shed, but the after-housing of the propeller shaft tunnel; and the sight of three-inch steel rivets being squeezed flat by a hydraulic riveter with no more fuss than a quiet hiss and a puff of blue smoke left him practically unmoved.

Back in Ken's office, Fred was enthusiastic.

"That's about the most interesting thing I'm likely to see this trip," he said, "I only wish my boy Tony had been here. You'd never have got *him* away from this yard." "Interested in ships, is he," said Ken Lockerbie, reflectively. "Well, now—I'll tell you what I'll do. I'll send your young man a regular progress report and pictures of No.1290 as it goes along. Then he'll be able to follow the whole thing from start to finish. Would he like that, d'you think?"

"I'll say," said Tony's father . . .

Well, there you are. All *New Zealand farmers, whatever they produce, are customers of ours and many of them have small sons who would be as interested as our fictional 'Tony Mackenzie'. So we are going to publish Ken Lockerbie's reports in our advertisements. Watch this space month by month and you'll find out how the ships that serve New Zealand are built.*

NEW ZEALAND OVERSEAS SHIPPING LINES

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Fruitgrowing

The Department from its inception gave a large measure of assistance to the fruit industry, the idea being that fruitgrowing could, in many districts, be associated with closer settlement. The stress laid on fruitgrowing at the experimental farms was directed to a similar end, though it was not by any means clear that the experimental farms had much influence on the industry as such.

The annual report for 1910 declared:

> Till the passing of the Orchards and Garden Diseases Act a person with money and a knowledge of fruit culture was chary of investing his capital in the industry, the ruin of his orchard, as a result of the proximity of neglected orchards, being almost certain. So strongly had this deterrent acted, and so neglected and pest ridden had the orchards become, owing to the general lack of knowledge of proper methods of cultivation and of the control of disease, that fruitgrowing had, speaking generally, become quite unremunerative. When, however, the Government stepped in and passed an Act, and appointed officers to see it enforced and to demonstrate up-to-date methods of soil treatment and control of disease, matters slowly but steadily improved. Now properly managed orchards are yielding higher returns per acre than any other branch of agriculture. Growers have now great confidence in the future of orcharding, and the industry is progressing rapidly.

Between 1908-09 and 1910-11 (no figures being collected in the intervening years) the total area in orchards increased from 29,212 acres to 32,733. In the latter year Auckland had the largest acreage—12,035—followed by Nelson with 4,899, Canterbury 3,943, Hawke's Bay 3,646, and Otago 3,081.

Moutere Hills Plantings

The most rapid rate of expansion was in Nelson. The extensive planting in the Moutere Hills did not begin until 1911, but interest had become more intense after the first commercial shipment of apples in 1908, samples from which were exhibited publicly in London.

This shipment received the benefit of the Government guarantee of 1d per pound for any fruit exported, a bonus which was first offered in 1908. It is interesting as being the first example of any type of price support in New Zealand. The 1910 annual report announced that the bounty would be continued for all New Zealand-grown apples sold in Europe provided that (a) such shipments were approved by Departmental officers, (b) they were packed in the Tasman or Peacock export case, and (c) the consignments were shipped in cool storage.

There was little knowledge of the economics of fruit production at the time and the boom in properties on the Moutere terraces was not based on any long-term assessment of the profitability of the orchards when they were finally established.

There was a fairly widespread assumption at the time that fruitgrowing would be an economic proposition on land of low natural fertility, insufficient account being taken of the fact that the costs of such items as spraying, pruning, etc., remain fairly constant irrespective of the yield. There was also an unwillingness to recognise that successful fruitgrowing requires a wide measure of experience, and it was not a venture allowing scope for the settlement of men with limited capital.

Between 1910 and 1920 large areas in the Moutere terraces, Nelson, were planted in fruit trees, but the enthusiasm of the promoters far outran their knowledge of orchard management and the limitations imposed by the low level of soil fertility.

Transport

In the first decade of this century the New Zealand railway system was approaching its present form. In the South Island this state of affairs had been attained 10 or 20 years earlier, but in the North Island the Main Trunk line was not completed until 1908, though Wellington had been linked with New Plymouth in 1886 and with Napier in 1891. But in 1910 North Auckland and the Bay of Plenty were still isolated, these links not being completed until 1925 and 1928 respectively, and the Stratford-Main Trunk line was not completed until 1932. The completion of the Gisborne line had to wait until 1943.

The main line from Christchurch to Invercargill was finished in 1879 and most of the branch lines fairly soon after, but the Midland railway did not operate until 1923 and the northernmost part of the South Island Main Trunk until 1945.

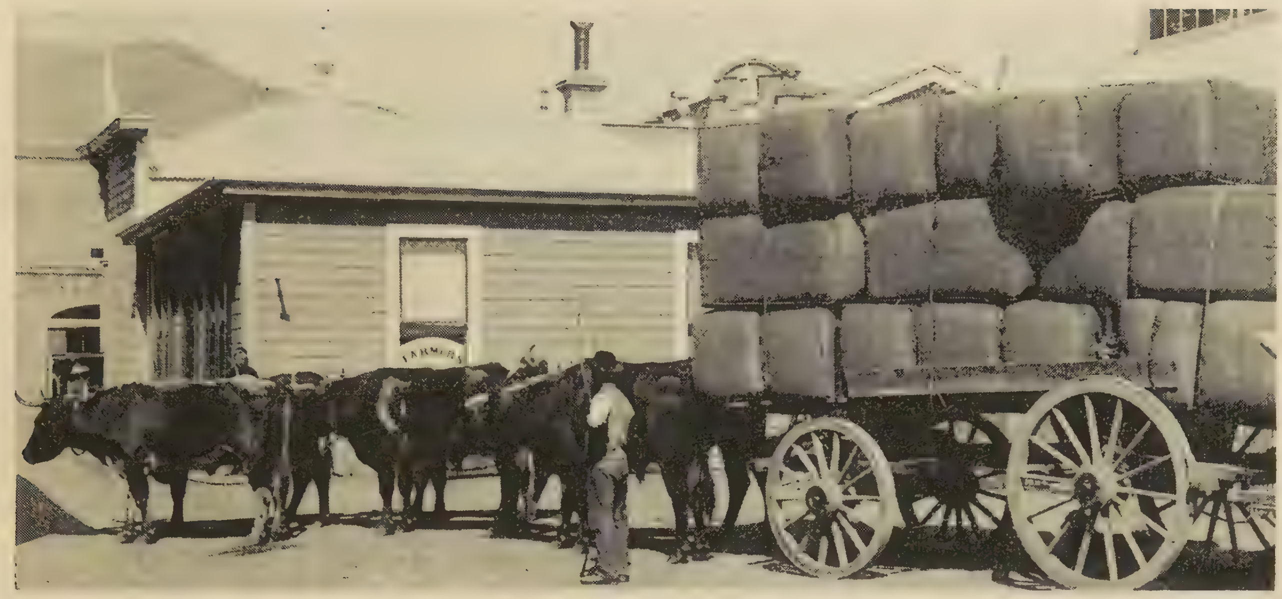
The public works policy adopted in 1870 laid special stress on the development of railways, for, as in most countries of the world that were being opened up, the railway was the key to development. In New Zealand costs were high and progress at times was often very slow, but successive Governments all proclaimed

(Continued on page 621)

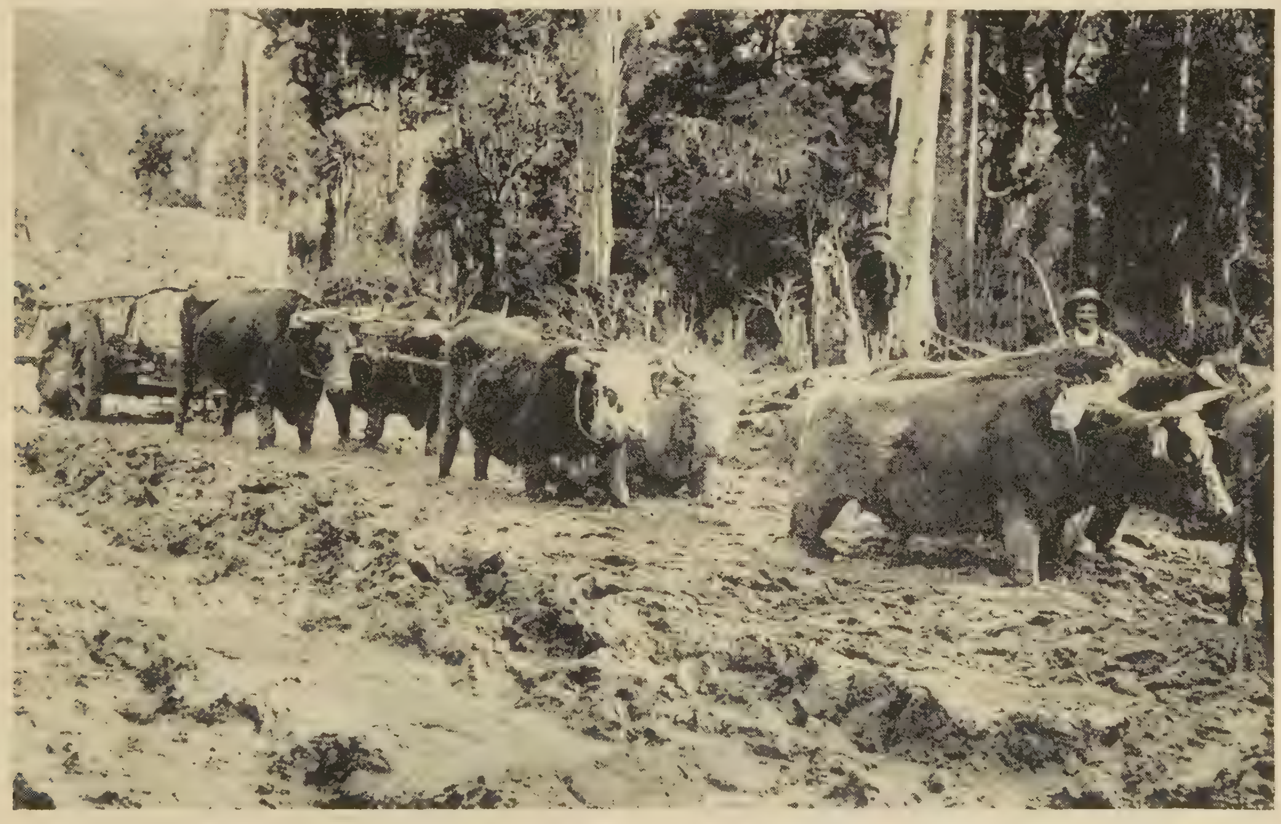
Mud by the Mile in the King Country

A GRAPHIC description of the state of affairs in the King Country in the early years of this century is contained in an article on the Ohura Valley in the "New Zealand Farmer" for January 1910. The article described many features of farming in the valley, closer settlement having been stimulated by the completion of the Main Trunk railway, and, as usual, many of the smaller settlers were turning their attention to dairy farming.

"The people at the lower end of the valley, below Mangaroa, go in a good deal for home separation, and the method of collecting the cream when the roads are bad would make the average manager tear his hair if he were asked to turn out first-class butter. The contractor has two pack horses across which are slung the cans in sacks, the two animals carrying the 320 lb weight, and in this rough and ready manner the cream is conveyed thirteen miles to Niho Niho." The article added: "The district is in the unenviable position of being practically metalless. If there were any stone suitable for making the roads the settlers are so enterprising that they would soon have a main road at least, which would be passable in winter time, but they are helpless, and till the railway comes along they must be content to be isolated for practically half the year. . . . Even in November . . . the main road was still a quagmire in many places and horse wagons were a rarity. Here and there you would meet a reconnoitring team floundering along with a load out of all proportion to the amount of struggling horseflesh, and it was astonishing to see the manner in which the drivers tooled their teams through the Slough of Despond. Bullocks, which will pull till they drop, were still on the road, a span of ten hauling a wagon with a mere handful of stuff, and even these patient plodders had quite enough to do in winning out—mud over the axles, and right across the whole width of the road."



Horse transport had practically superseded the bullock team in most settled parts of the country by 1910, though bullocks were occasionally used for heavy haulage and where the going was too hard for horse teams. The bullock team illustrated below on a back country road is working in conditions similar to those in the Ohura Valley described on the opposite page.

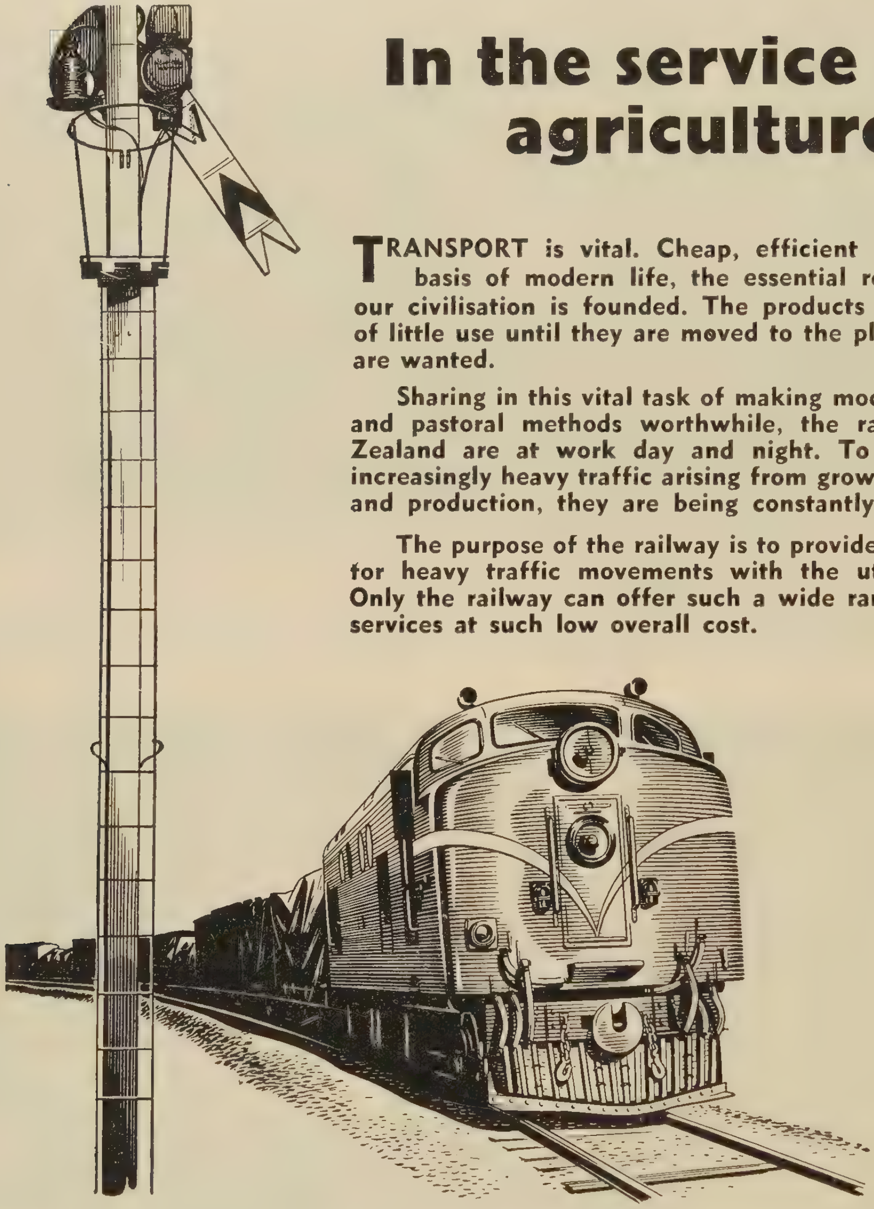


In the service of agriculture . . .

TRANSPORT is vital. Cheap, efficient transport is the basis of modern life, the essential rock upon which our civilisation is founded. The products of our land are of little use until they are moved to the places where they are wanted.

Sharing in this vital task of making modern agricultural and pastoral methods worthwhile, the railways of New Zealand are at work day and night. To cope with the increasingly heavy traffic arising from growth of population and production, they are being constantly improved.

The purpose of the railway is to provide a high capacity for heavy traffic movements with the utmost economy. Only the railway can offer such a wide range of transport services at such low overall cost.



**The products of the land go down to the sea . . .
on rails — the high-capacity highway !**

NEW ZEALAND RAILWAYS

(Continued from page 617)

their intention of completing the railway system, though many of the grandiose schemes put forward in the 1870s had been dropped and by 1910 the future programme was essentially a realistic one. The total mileage in 1910 was 2,717, of which 1,144 was in the North Island and 1,573 in the South Island.

Roads for Feeding Railway

The emphasis on railways over this whole period made roads a secondary consideration when public works policies were being planned. The road was essentially a feeder to the railway and, as such, it was necessary only to provide access to the nearest railway station. Any system of arterial roads was unnecessary and, for this reason, no demands for the creation of such a system were made.

With the abolition of the Provincial Councils in 1876 and the passage of the Counties Act in 1877, the broad policy adopted was that the construction and maintenance of roads should be essentially left to local bodies—counties and road boards—to carry out. Some provision was made for subsidies, but these were by no means generous. Local bodies, however, did not at any stage have the funds to undertake road construction, which, in parts of the North Island especially, was very expensive.

In 1885 an Act was passed which allocated financial assistance to local bodies on the basis of the rates collected, but in succeeding years the emphasis on reduced Government spending resulted in local bodies receiving very much less than was envisaged in 1885.

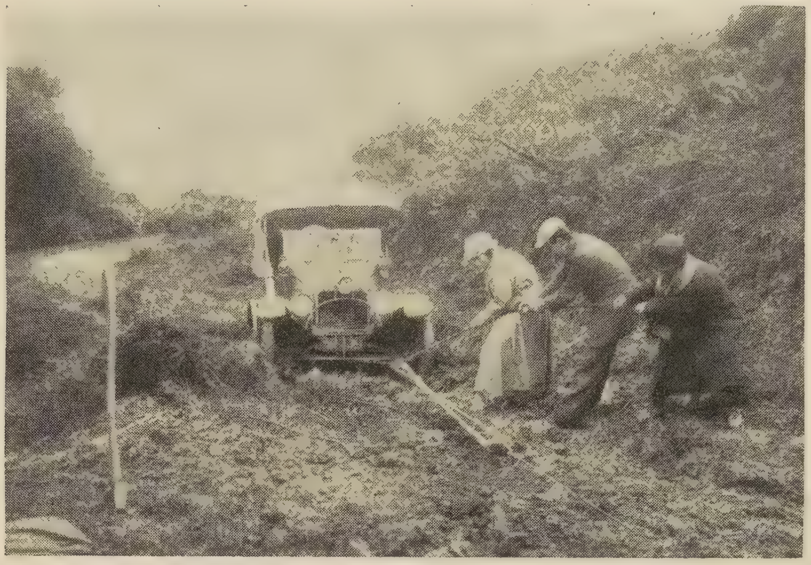
In 1896 an attempt was made to rationalise the system by reducing the multitude of counties and road boards that were receiving assistance, but this venture was not proceeded with in the face of local jealousies.

From the mid 1890s the pace of road construction increased, though the administrative machinery still functioned rather inefficiently. The Government was committed to a programme for closer settlement, much of it in back country areas. Settlers in such areas were promised roads as soon as possible, and the settlers, in turn, brought as much pressure as possible on their Parliamentary representatives to make available finance for roads. Settlers in parts of North Auckland and in the King Country would, however, have regarded the progress made as very slight, and many of the roads that were constructed by the Government in these areas were almost useless in winter. Metalling and maintenance of the roads were usually left to the county council, which often failed to do anything about it.

The demand for better roads also came with the development of the dairy industry. The dairy farmer, in the days before home separation, had to get his milk to the factory every day, and providing roads to enable this to be done was an especially heavy drain on local resources.

All these facts compelled the Government to reconsider the manner in which the finance allocated for roads was spent. In 1903 it was decided that the Government would construct new roads, but immediately this was done they would be handed over to local bodies to maintain, and all Government funds would be devoted to road construction. The next year it was also decided to restrict work in the more closely settled areas and confine Government construction activities to the back country.

Hazards of Early Car Travel

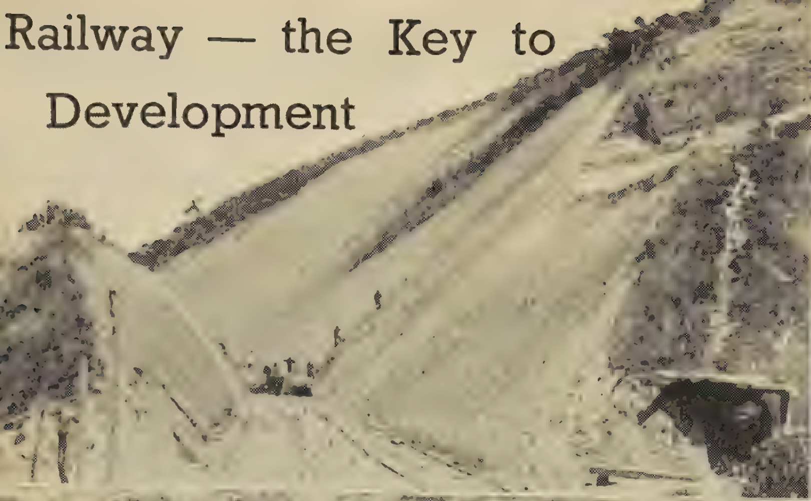


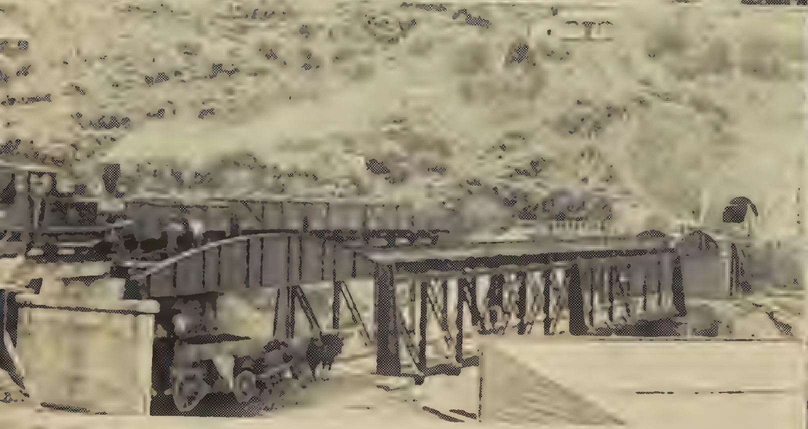
CAR travel in the early years of this century was a hazardous undertaking, because though the main access roads were kept in reasonable order for the horse-drawn coaches, the smaller side roads were often impassable after heavy rain. Such a road during the early part of the First World War was the northern Wairarapa side road illustrated above.

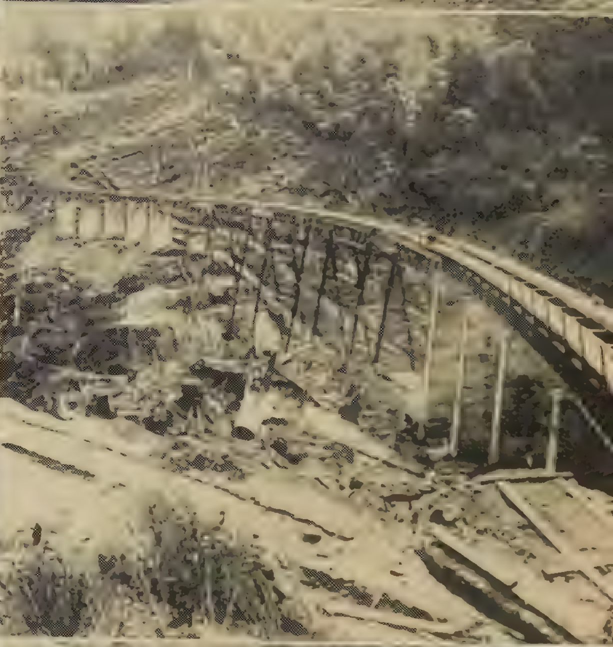
The farmer concerned left his farm at Pori early one morning and motored to Palmerston North with his sister to pick up a friend who was coming to stay. The first part of the return journey was uneventful, but after leaving the main highway near Mangatainoka the car bumped and rattled over the narrow shingle-surfaced Makuri road. After struggling up the steep, winding clay road on the side of the Makuri Valley, the car became firmly stuck on an easier grade 1½ miles from the farmer's home. Lacking a block and tackle the three passengers trudged the last distance, returning the following morning to free the car.

After the First World War a 4,000-acre block of land further along the road was divided into returned servicemen's farms and the loop of road on which the car is standing was cut off by a new road (well known in the district as the Deviation).

Railway — the Key to Development







As in most young countries of the world, the key to development in New Zealand has been the railway. Soon after each section of back country was settled the farmers' demand for connection with the railway, by which supplies could be easily obtained and farming produce disposed of, became insistent and incessant. By 1910 there were 2,711 miles of railway, 1,137 in the North Island and 1,574 in the South Island. In many parts of the country construction of the line was difficult, laborious, and slow. These illustrations show: TOP LEFT—Excavating a deep cutting on the Otoko bank on the Gisborne-Moutohora railway in 1907-08. TOP RIGHT—Work near Ohakune during the building of the Main Trunk railway. MIDDLE LEFT—Unloading coal at Karangahake double-decker bridge during construction of the Paeroa-Waihi railway. MIDDLE RIGHT—Hapuawhenua Viaduct, on the Main Trunk railway, nearing completion in 1908. BOTTOM LEFT—Arrival of the first train at Wellsford in 1909. BOTTOM RIGHT—Construction trains on Raurimu Spiral about 1907.

In spite of all these moves progress in opening up roads fell far short of what was demanded, and in 1908 the Government made a further £250,000 available for road construction and undertook to spend £1,000,000 on the work in the succeeding 10 years. In addition portable stone crushers were bought and made available to local authorities, and in districts where metal was scarce, which included much of the North Island, a reduction of 25 per cent on freight rates for metal on the railways was authorised.

Road Building Tackled Piecemeal

This was the situation in 1910, when motor transport was just beginning. The country's road system had certainly not kept pace with the progress of settlement and the system of administration had advanced little beyond what was established in the 1870s. Road construction by the Government was invariably tackled in a piecemeal fashion, arising in part from the assumption that the road was a feeder for the railways. In 1912, for example, the number of items listed under road expenditure in the Public Works vote was 2,300 and the average cost of each item was £210. This system arose because there was no national roads policy and money was spent where the local clamour was loudest. The total amount allowed for road construction in the 1909-10 financial year was £271,000 in the North Island and £110,000 in the South Island. For roadless North Auckland the allocation was approximately £16,000.

In most parts of the South Island road construction and maintenance did not present any serious difficulties. Gravel was cheap and plentiful, the country was clear, and firm and stable foundations existed for roads. As a result county councils were able to undertake the burden much more readily. This was a contributing factor to the development of the fat lamb industry in Canterbury, for example.

But in much of the North Island the situation was very different, especially as the river shingle that was so common in the South Island was very scarce over much of the North and, in many districts, was virtually unobtainable. This not only increased construction costs but increased maintenance charges too, and in thinly settled areas the revenue derived from rates was insufficient to meet such charges. The result was that many roads rapidly fell into disrepair and in winter were often little better than useless.

Demand for Railway

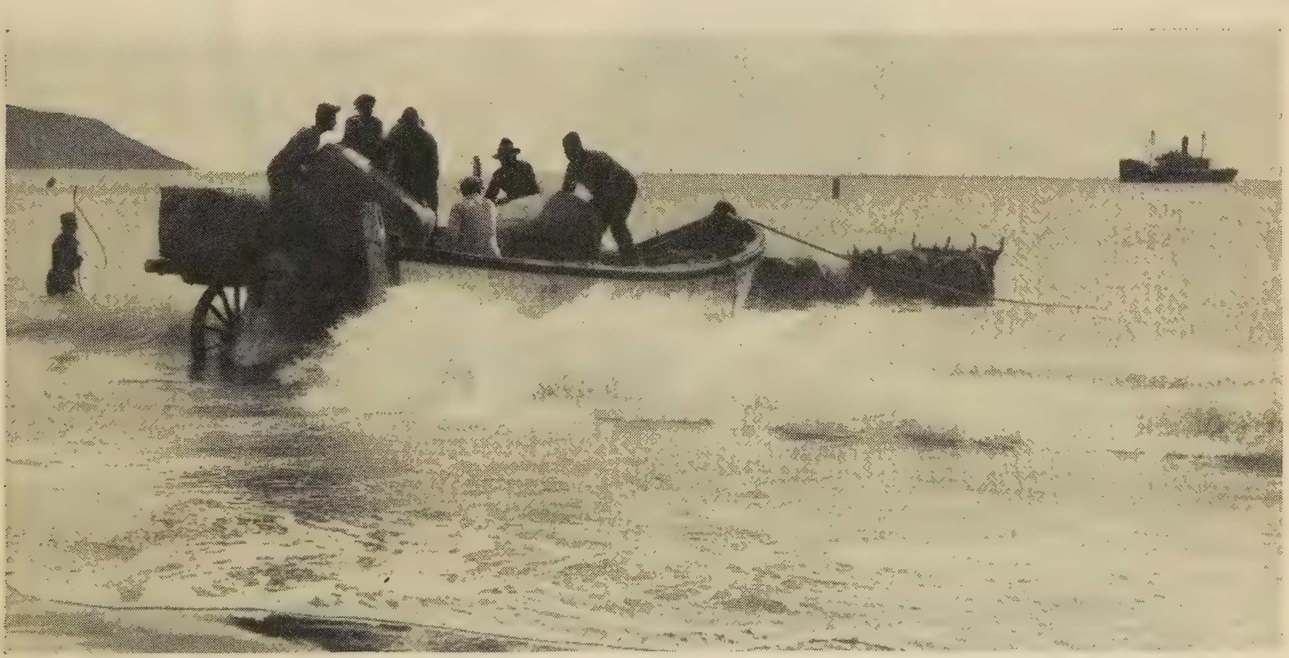
For newly established settlers on back sections the cost of bringing their supplies in by road might make a difference between success and failure and, beside the lower cost of transport that would be brought about, there was an additional reason to agitate for a railway. The construction of a railway would inevitably give a great stimulus to land values in the districts which it passed through.

The high costs produced by poor roads were touched on by a "New Zealand Farmer" correspondent in describing the Ohura area:

> The only thing that keeps the district back now is the lack of a railway. In the winter time the valley is practically isolated, and freights go up to almost famine prices. An instance: Flour, instead of £10 a ton, costs double by the time the haulage over the execrable roads is paid for, and other necessaries are costly in proportion. Most of the settlers are in a small way and just struggling along, and are not in a position to take advantage of the fine weather and get in big stocks to last out the winter. This absence of decent means of communication means that the valleyites have to be content with about thirty per cent less for their produce than people in more favoured districts. It is impossible to cart heavy stuff in the winter, and goods have to be packed, the cost being in the neighbourhood of £10 a ton. When the roads are in good order the cost of carting is from £2 to £4 a ton.

Use of Shipping

North Auckland suffered equally from the poor state of the roads, largely from the same reasons, though some parts of North Auckland had one advantage in that carriage by



["*Weekly News*"

On many sheep stations on the east coast of the North Island wool was loaded on to small coastal steamers by surf boat, a method used in some districts until the 1930s.

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water was easier than elsewhere. For instance, in 1902 the directors of the Northern Wairoa Dairy Company called for tenders for the collection of cream by river steamer and this company used river steamers up until 1933.

Before 1914 both coastal and river shipping played a much more prominent part in the transport system than in later years.

Before the opening of the Main Trunk railway travellers from Auckland to Wellington could bridge the gap between the two railheads by coach or they could go by rail to New Plymouth and on by steamer to Onehunga. Whangarei, Dargaville, Hokianga, and the Bay of Islands were all served by steamer, as was the Bay of Plenty. Similarly a traveller going from Wellington to Wairoa or Gisborne might go by sea, and much of the wool from coastal stations, right from Palliser Bay up to East Cape, could be loaded on to surf boats and then loaded on to a coastal freighter.

Research and Extension

In 1908 with the retirement of the first Secretary of Agriculture, John D. Ritchie, the Department was reorganised and two new functions, commerce and tourists, were given to it. The new head was an administrative officer, Frederick Sidney Pope, a professionally trained head not being appointed until 1919, when Dr C. J. Reakes took over control. The Minister of Agriculture was the Thomas Mackenzie who at the time represented the Taieri electorate in Parliament. He took over the portfolio at the beginning of 1909 and held it until 1911. With the advent of the Reform Government in 1912 he was appointed High Commissioner in London, a post which he held until 1920.

The Department itself was, after the 1908 reorganisation, made up of five divisions:

Livestock and Meat
Fields and Experimental Farms
Orchards, Gardens, and Apiaries
Dairy-produce
Commerce and Tourists

In addition there was a Biology Section.

The total staff numbered 380 of whom 30 were stock inspectors and 61 rabbit agents.

Livestock and Meat Division

The Livestock and Meat Division was headed by Dr Reakes, who took over the work in 1908, when Dr J. A. Gilruth left the Department to take up the position of Professor of Veterinary Pathology at Melbourne University. The functions of this division were fairly clear cut, being essentially bound up with the enforcement of regulations regarding animal health and of meat inspection. Veterinarians in the course of their duties did advisory work, but there was no particular emphasis on this. A good deal of stress in the work was laid on improving the quality of horses. The standards laid down by the Army when buying horses during the Boer War had drawn attention to the defects of New Zealand horses and in 1910 the passage of the Defence Act had further stimulated interest in the question.

Stock health in the period about 1910 was fairly good, the Department's veterinarians being concerned with such familiar problems as blackleg, mastitis, tuberculosis, contagious abortion, and "bush sickness". In the decade before 1910 time had been devoted to sporadic outbreaks of anthrax which were invariably traced to the use of unsterilised bonedust imported from India and used as a fertiliser for turnips.

The annual report for 1910 drew attention to the difficulties and the losses experienced by sheep farmers in parts of the North Island as a result of facial eczema:

> The Gisborne district has suffered severely, and many cases have also been met with in the Bay of Plenty, Northern Wairoa, Taranaki, and West Coast (North Island) districts. The cause is doubtless to be found in the character of the autumn feed, mild weather and a plentiful rainfall following a fine summer having produced a much more luxuriant growth than in normal seasons.

On the subject of bush sickness the report was very brief:

> It is anticipated that a thorough investigation into the cause of this trouble and the remedial measures necessary will be initiated during the coming year. The former Chief Veterinarian made a commencement in this work, but owing to various considerations was unable to carry it beyond its preliminary stage. The loss entailed upon settlers in the affected district is so great that it has become a matter of necessity that everything possible should be done in endeavouring to solve what is undoubtedly a most difficult problem.

This Division had also established two small poultry demonstration plants at Burnham near Christchurch and at Milton.

The system of compulsory meat inspection was introduced in 1901 in the face of a considerable opposition from the meat export works. Ritchie also wished to see a system of grading established, but he was unable to secure sufficient agreement for such a move.

Inspection of abattoirs was introduced in the same year. Some of Gilruth's reports contain a graphic description of the deplorable conditions under which meat was killed for local consumption.

Fields and Experimental Farms Division

The Fields and Experimental Farms Division had a broad range of functions which at times were difficult to separate from those of the Livestock Division. It was responsible for stock inspection generally and the administration of the associated regulations and was also responsible for the enforcement of the regulations regarding rabbits and noxious weeds. Stock inspectors were also expected to perform some advisory work, but the scope for this was limited. However, two instructors, one for the South Island and one for the North Island, had just been appointed to advise on

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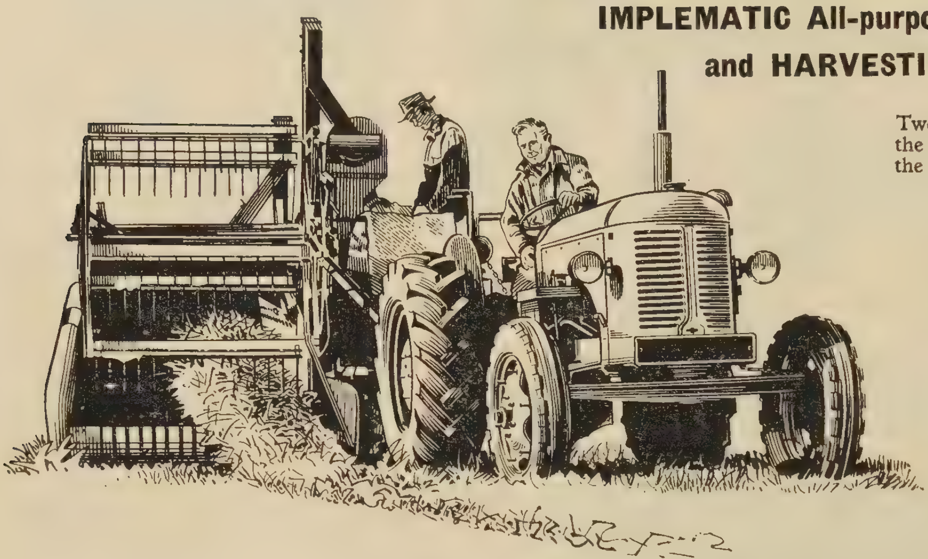

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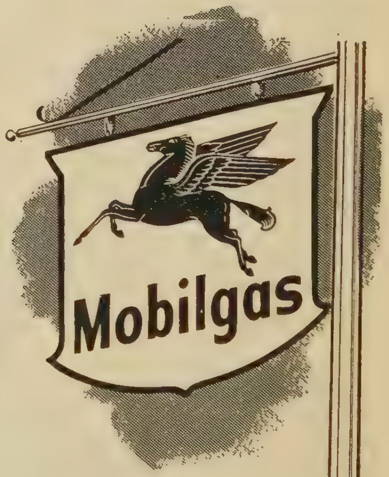

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the laying down of experiments, though by 1910 they had barely had time to achieve very much.

Apart from stock inspection the major function of the Fields and Experimental Farms Division was the running of the experimental farms, six of these being in operation in 1910—Waerenga, Ruakura, Moumahaki, Weraroa, Tauranga, and Arataki. The last two were concerned with investigations into fruit production. Two other properties, Bickerstaffe in North Auckland and Selwyn on the pumice country, were acquired later but were never of much importance.

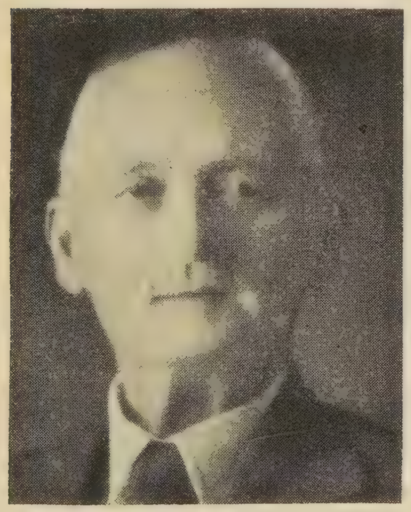
Another function of the Division was the provision of a hemp and phormium grading service.

This Division was in 1910 under the control of Edmund Clifton, who had joined the old Stock Department in 1884 after some years' experience in managing sheep stations on the east coast. Clifton retired in 1916 and went as New Zealand Commissioner to the international exhibition in San Francisco and subsequently was a contributor to the "Farmers' Weekly" in Auckland. The Assistant Director was John Lesley Bruce, who had also come up on the stock inspection side, joining the Department in 1891, and retiring in 1924.

Orchards, Gardens, and Apiaries Division

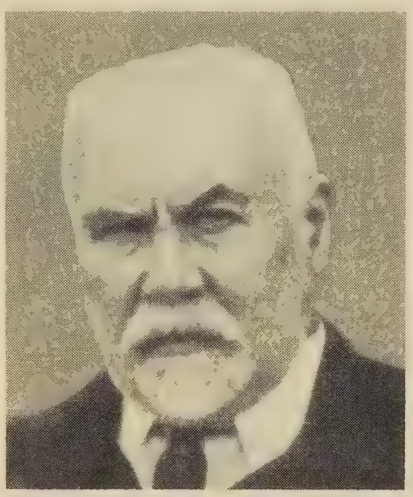
The Orchards, Gardens, and Apiaries Division had a fairly clear-cut function, being concerned mainly with regulatory work and to a less degree with advisory work on fruitgrowing, vegetable production, and beekeeping. Thomas William Kirk, who had joined the Department in 1892 and retired in 1920, was in charge of this work and had initiated some of the work on the identification and study of particular pasture plants which Cockayne was to continue.

The Government of the day was very interested in fruit production, as it appeared to provide greater opportunities for closer settlement, though the first commercial shipment of apples to the United Kingdom had been made only two years earlier in 1908. It was also true that many of the technical problems associated with establishing fruitgrowing on a commercial basis had still to be overcome, and many parts of the country were unsuitable for commercial fruit production. The Division published a large number of descriptive leaflets, but was not able to carry out any research work owing to the lack of qualified men to undertake it.



[Blakey

Edmund Clifton, who was associated with New Zealand farming for 60 years. He was appointed Director of the Fields and Experimental Farms Division in 1909 and organised the establishment of Ruakura, Waerenga, Weraroa, and Moumahaki as large mixed farms on which a great deal of experimental work was done.



John Lesley Bruce, Assistant Director of the Fields and Experimental Farms Division in 1910. He had previously been a Stock Inspector, having joined the Department in 1891.

Dairy-produce Division

The Dairy-produce Division had probably the greatest impact on individual farmers and on the development of the dairying industry. The Division's functions were fairly clear cut and not fundamentally different from what they are today.

From its coming into office in 1891 the Liberal Government had endeavoured to assist the dairy industry because it offered a more secure basis than anything else for the promotion of closer settlement.

[S. P. Andrew

Thomas William Kirk, who was appointed Biologist of the Department in 1893 and who in 1910 was Director of the Orchards, Gardens, and Apiaries Division.

A good deal of progress had also been made in encouraging higher quality standards in the factories and a beginning, though not a very successful one, had been made with improving standards of hygiene on the farm.

Compulsory branding of dairy produce for export was introduced as early as 1892, followed in 1894 by the big step forward of compulsory grading.

In 1908, the year in which Sir John Findlay, the Attorney-General, made a general consolidation of so many Acts, a general consolidation of those relating to the dairy industry was also made. Regulations were also drawn up for the establishment of a system of compulsory inspections of farm dairies to cap off the other legislation in the field.

The Department's reports are filled with complaints about the difficulties faced by factory managers as a result of unhygienic milk being delivered at the factory and the practice of home separation, which was just coming into use, apparently made the situation worse. In the face of strong criticism plans for the compulsory inspection of farm dairies were dropped.

In 1910 the Director of the Dairy-produce Division was David Cuddie,

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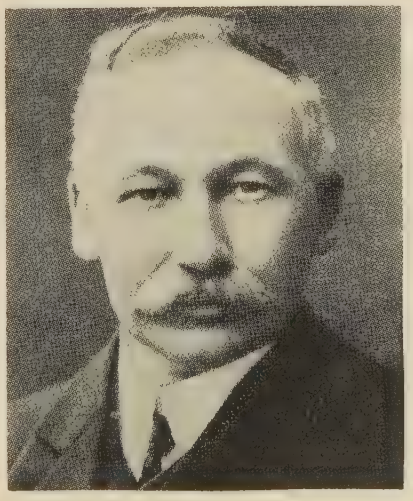
The first exports of apples were shipped in 1908 and the Department of Agriculture devoted a great deal of attention to emphasising the need for careful grading and packing if the newly established trade was to expand.

who had joined the Department in 1900 after a number of years' experience as a factory manager. The Assistant Director was Winnard Milton Singleton, who had come to New Zealand from Canada in 1901 as Instructor in Cheese Making. He became Director in 1921 and retired in 1944.

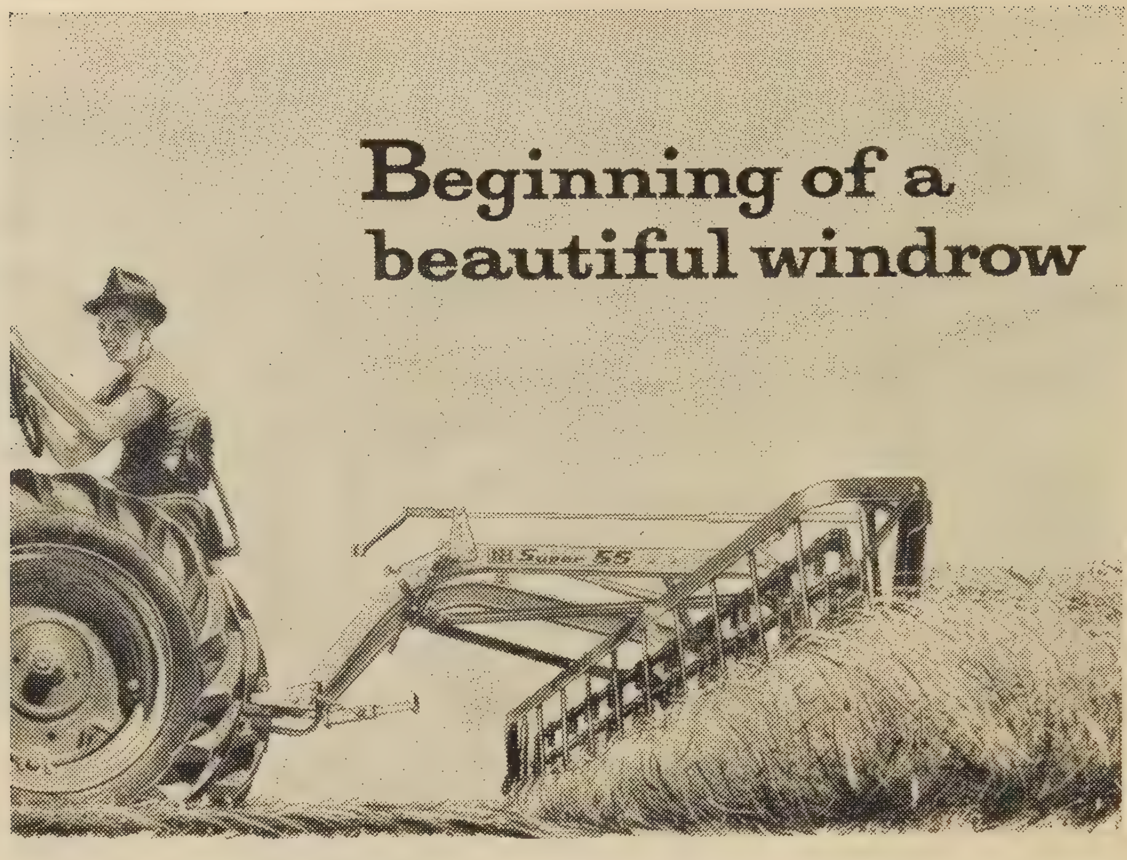
The Department's annual report for 1910 gives a picture of the state of affairs when instructional services for dairy farmers were just beginning, and the approach based on the compulsory inspection proposals put forward in 1908 had been dropped:

> According to the rearrangement of the duties of the various Divisions of the Department, the work of instruction at dairy farms has been undertaken this season to a limited extent by our Cheese and Butter Instructors. So far, this Division has merely made a start with these new duties. We were not authorised to undertake this work until our previous staff of Instructors were engaged with ordinary instruction work at dairy factories in the spring time. With the addition of these new duties more instructors were necessary. Four additional men were appointed as soon as possible; but it was necessary that they should not leave their previous positions until successors were available. . . .
>
> During the summer months no attempt was made at general farm instruction. Visits were paid only to those farms where the need of some improvement in the milk supply had evidenced itself at the factory. Seven Instructors were working on these lines, and three officers engaged in grading and instruction work were also working in the same manner.
>
> The work of instruction at dairy farms is one of great possibilities. Many dairy farmers require assistance such as our officers can give, and the necessity is never so fully realised as during the hot summer months—just when our officers are busiest with that portion of their work which pertains to the factories. . . .
>
> As a part of this work at the farms, the Instructor has an opportunity of bringing under the farmer's notice an account of some of the benefits to be derived from cooling. It is almost impossible to alter the standard of cleanliness peculiar to any individual; but, provided milk produced under conditions somewhat below the average be cooled properly as soon as drawn from the cow, a great improvement is generally effected. This improvement is usually more marked than that caused by an improved standard of cleanliness at the farm, and is usually more lasting. . . .
>
> The position of the milk-stand and the drainage from the shed are frequently found to be unsuitable. It is a failing all too common to place the milk-stand in too close proxim-



David Cuddie, who was in charge of the Dairy-produce Division from 1906 to 1921. Under his direction the instruction and grading services of the Department were built up and the reputation of New Zealand dairy produce was enhanced.

Beginning of a beautiful windrow



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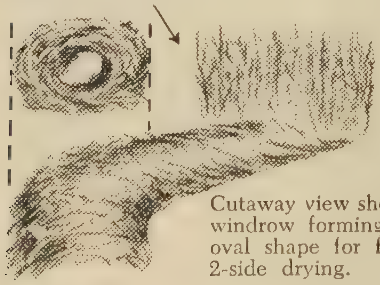

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ity to the cowshed or other contaminating influence. . . .

MILKING-MACHINES

The work of instruction at dairy farms has brought our Instructors into more intimate contact with milking-machines than has been the case in the past. We have ever looked on milking-machines with considerable suspicion so far as the production of good-flavoured milk was concerned. Curd-tests were made some years since, which proved that at that time the machines were having a deteriorating influence on the quality of the milk supply, excepting in such instances as where the owner's standard of cleanliness was much above that of the average dairy-farmer, and even some dairymen in this category had difficulty in producing a moderately satisfactory article.

With the utmost cleanliness a good quality of milk is forthcoming, even with the use of milking-machines. Our Instructors find, however, that, although some dairymen are delivering good milk and are using milking-machines, a large proportion of the most inferior milk being offered at factories is coming from farms on which these plants are installed. A considerable number of milking plants have been inspected, and in a number of instances Instructors have found it necessary to take the whole milking portion of the plant to pieces and effect a general clean-up before improvement could take place.

Time will doubtless prove that all makes of milking plant now on the market can be considerably improved from the point of view of production of a good clean milk-supply. The trouble of effecting proper and adequate cleansing is at present too great and the work takes too long. . . .

Even dairymen not using milking-machines should provide themselves with facilities for a plentiful supply of hot water for the purpose of washing dairy utensils. A small boiler or a copper of proper size is not expensive when the value of the farm turnover in milk is considered, and in one day it may save more than its entire cost. All over-ripe and strong-flavoured milk could be very much improved, and in nine cases out of ten the trouble could be entirely overcome, by a judicious use of boiling water on the milk-utensils and the use of cold water for cooling the milk.

Water, at boiling-point for scalding all utensils and articles which come in contact with milk, and at 50° to 60° for cooling all milk as soon as milked, is a *sine qua non* of a good milk-supply.

Biology Section

The Biology Section was made up of A. H. Cockayne with one or two assistants. Much of the Department's basic scientific work was undertaken by Cockayne working with very limited resources. B. C. Aston, the agricultural chemist, was after 1908 separated from the Department for a few years and was attached to the Dominion Laboratory. This caused a serious breach in the continuity of the work.

Experimental Farms

When the Department was formed in 1892 it took over from the Agricultural Branch of the Lands Department a wattle plantation and 1,300 acres of indifferent land at Waerenga, near Te Kauwhata. It had been thought that wattle bark would find a ready market in the tanning industry and for that reason the planting of wattles should be encouraged.

The demand was, however, for the establishment of a large mixed farm, a purpose which could not be fulfilled at Waerenga, and in 1894 the Department took over Moumahaki, near Waverley, a property of 250 acres, of which 20 acres were set aside for experimental work with fruit trees. The bulk of this property had been cleared and grassed, though some of it was still in light bush when the Department took over.

Six years later, in 1900, the Department took over from the Labour Department some 650 acres of land near Levin. This area was being developed by the Labour Department to provide work for the unemployed, but by 1900 the work had not advanced very far. The land was initially in very heavy bush and by 1900 had been cleared, ring fenced, and surface sown with grass, but was still a mass of logs and stumps and several years' work was necessary before much of it could be cultivated.

Ruakura, near Hamilton, was taken over in 1901, the property comprising some 700 acres. The land had been mainly swamp, but most of it had been drained before 1901. The purchase price was £8 per acre.

In subsequent years a number of other properties were acquired: Arataki (near Havelock) and Tauranga for experimental work with fruit, Milton and Burnham as poultry experimental stations, and Bickerstaffe in North Auckland and Selwyn on the pumice country for experiments in developing problem land.

The three large farms, Ruakura, Moumahaki, and Weraroa, were all organised as large mixed units, with Waerenga, despite its size, carrying on operations on a somewhat smaller scale and with increasing attention being paid to fruit and vine culture.

Sheep and cattle were run on all the farms, a fair area was devoted to fodder crops and cereals, and on each an area was devoted to fruitgrowing.

Before the advent of cream separation on the farm, dairy companies established creameries in outlying districts to which farmers could bring their milk to be separated, but these gradually disappeared after the practice of home separation was generally adopted.

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Waerenga was the first experimental farm established by the Department, having been taken over from the Lands Department in 1892. As the other three large farms of the Department were developed as large mixed units increasing attention was given at Waerenga to fruit and vine culture.

A number of stud horses, both draughts and thoroughbreds, and Shorthorn, Jersey, and Ayrshire bulls were also established on the farms, the intention being that farmers in surrounding districts should be able to grade up their own animals with the aid of the pedigree stock on the farms.

Fertiliser Trials

By 1910 nothing of very great consequence appeared to have been accomplished on the farms in experimenting with the various classes of livestock, but a good deal of useful work had been done through the laying down of fertiliser trials under a wide range of conditions.

None of the present-day statistical techniques was known at the time and the results of various trials were not subjected to any forms of analysis, but the value of this work for demonstration purposes was considerable.

In the Waikato and South Taranaki the topdressing experiments, as an example, must have been seen by a large number of farmers who may have adopted similar practices on their own farms.

A beginning was also made with plant breeding at Ruakura and Moumahaki, a rust resistant variety of oats being developed at Ruakura. The work at Moumahaki proceeded along similar lines for some years, but no particular results were obtained and there was no machinery for multiplying and passing into commercial channels the seed already produced.

Use as Training Schools

Another function which was being given some attention in 1910 was the use of the farms as training schools for young men who wished to learn farming and a start was made at Ruakura and Weraroa. Some thought was even given a few years later to Weraroa becoming a training school for agricultural scientists, though this was not contemplated in 1910.

Farm Properties Advertised in 1910

1,100 acres, Cambridge district, two-thirds in grass, balance in scrub—£7 10s. per acre.

105 acres carrying 25 dairy cows, 9 miles from New Plymouth—£14 10s. per acre.

23,500 acres, inland Hawke's Bay, 3,000 acres in grass, balance in bush—£1 per acre.

390 acres, Takapu district—£14 per acre.

300 acres, mixed farm, Marlborough—£25 per acre.

1,600 acres of lighter land, mid Canterbury—£10 10s. per acre.

318 acres, mixed farm, Gore district—£8 10s. per acre.

The policy of running each experimental farm as a large mixed unit was to some extent modified by circumstances, as each one tended to concentrate on some particular aspect of farming.

Moumahaki was organised as a farm where the emphasis was on cropping with dairying and sheep as subsidiaries.

Weraroa from the start devoted a fair amount of attention to dairying and Ruakura, too, gave some stress to dairying and the growing of appropriate fodder crops for dairy cows. On all three properties sheep received much less attention than might have been expected and apart from some experimental work with different breeds no long-term sheep investigations were made.

In 1912 the Secretary of Agriculture in his annual report strongly criticised the experimental farms for their failure to achieve the purposes for which they had been intended. He declared that they commanded little respect among neighbouring farmers and that the experimental work undertaken was out of touch with practical needs. His main criticism was that, while New Zealand farming generally was becoming more specialised, the large mixed units were unable to show any of the advantages of specialisation. His solution was, however, the establishment of several more such farms, each of which would specialise in one particular branch of farming, but he appeared unaware of the need for men with proper scientific training to undertake any fundamental research.

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Farming Prospects in 1960

A farmer in 1910 reflecting on the prospects before him, would have had cause for reasonable optimism, more perhaps because of the steady appreciation in the value of his property than because of the gradual rise in prices that had been taking place, with some exceptions, over the previous 10 years or so.

The current outlook was not unfavourable. Meat prices had improved and fat lambs were bringing 12s. 6d. to 15s. per head. The 1908 slump in prices that was associated with a glut on the Smithfield market and the after effects of the Wall Street panic in 1907 was now a thing of the past. Wool prices were reasonably steady too, though prices at the sales which opened in November 1910 were a shade lower than they had been the previous season. Medium crossbreds during the 1909-10 season sold for 9d. to 11d., but in the following season they fetched from 9d. to 10½d. About half the season's production was still consigned to London for sale, but local auctions were increasing in importance.

For the season beginning in 1910 butter factories were paying out to suppliers 10½d. to 11d. per pound for butterfat, and suppliers of cheese factories received about 1s. Dairy company directors had to decide each season whether they should consign direct to London, accepting the risks of the market, or sell the season's production to a merchant. Whatever they did they were bound to be sharply criticised by the suppliers.

On the wider question of markets for his products, the farmer in 1910 again had cause for optimism. Despite sharp fluctuations in prices from time to time the British market had shown it could absorb all that New Zealand could produce; it would be wrong to say that the need for other markets was ignored, but then as now exporters soon came up against the barriers of prejudice and high tariffs when they attempted to sell meat or dairy produce in Europe.

Perhaps most significant of all, farmers were showing an interest in scientific progress and in some parts of the country were beginning to put into practice the almost revolutionary concept of topdressing grassland. Very little attention in farming journals was devoted to topdressing and there must have been few who perceived its far-reaching importance. Attention was concentrated to a much greater degree on improving livestock quality by the use of pedigree sires and careful selection.

It was realised of course that the frontiers of settlement had been pushed almost as far as they could go and that further increases in production would have to come from the more intensive use of land already in production. Land development had proceeded steadily in the North Island in the previous five years, sheep numbers having risen considerably; there was a parallel movement in the better class country from sheep to dairy cows, a movement that would be more rapid in the next decade.

In the South Island the farming pattern was much more static, though within a year or so there would be assertions that it was no longer profitable to grow wheat, perhaps because Australian competition was much keener. The great increase in the area of wheat in Australia after the breaking of the 1902 drought and the pioneering work of William Farrer in the plant breeding field meant that Australian wheat could be landed in New Zealand more cheaply than in the past.

The appearance of the "Journal" in 1910 was in itself an indication of the increasing importance attached to scientific inquiry in agriculture, and in the first issue the Minister of Agriculture listed some of the problems his Department was proposing to tackle:

> In New Zealand there are many problems relating to agriculture to be solved, such as the restoration and conservation of the grasses and edible plants of the pastoral lands of the central regions of the South Island, the development of wide areas of the interior of the North Island, and the utilisation of land situated on the western coast of the South Island. These lands have not been made full use of for pastoral or agricultural pursuits on account of the difficulties that they present. It is the intention of the Department to undertake investigations in the direction of the elucidation of these special conditions. . . .

The Minister listed only some of the most intractable problems, but there was widespread awareness of the need for detailed investigations into many fields.

The index to volume 100, which would normally have been included in this issue, will be published in the July issue of the "Journal".

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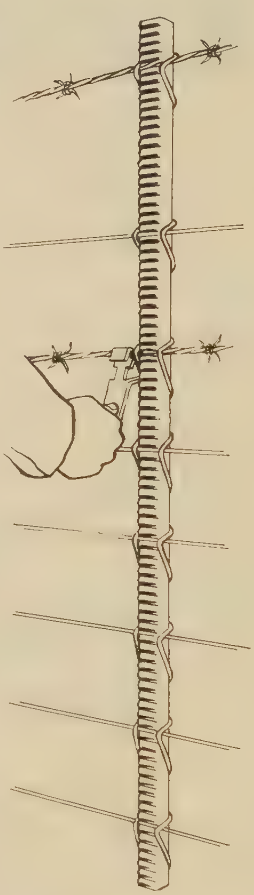

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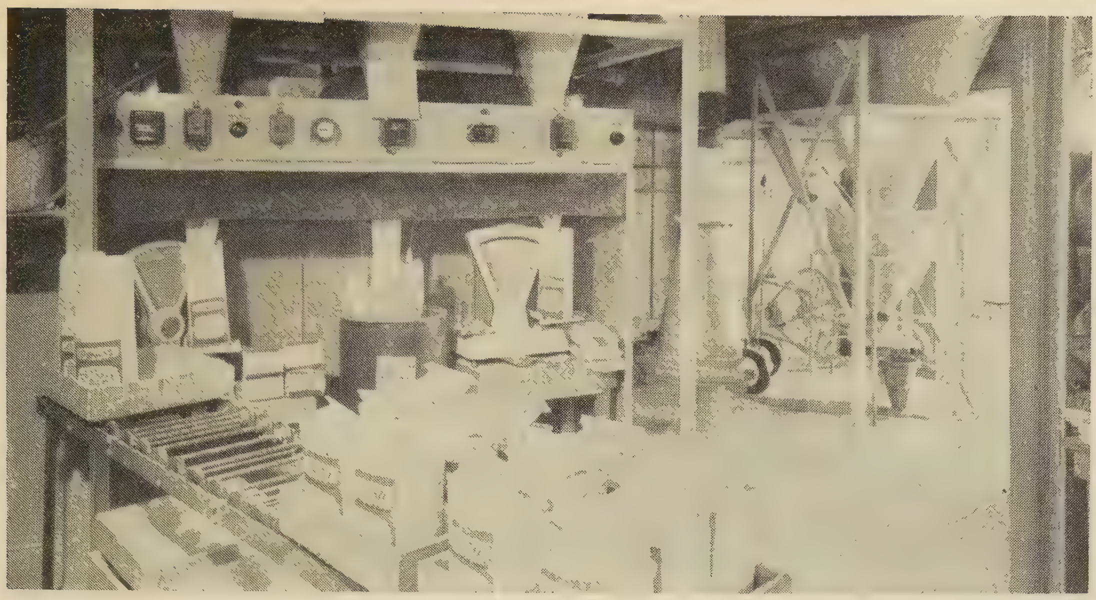

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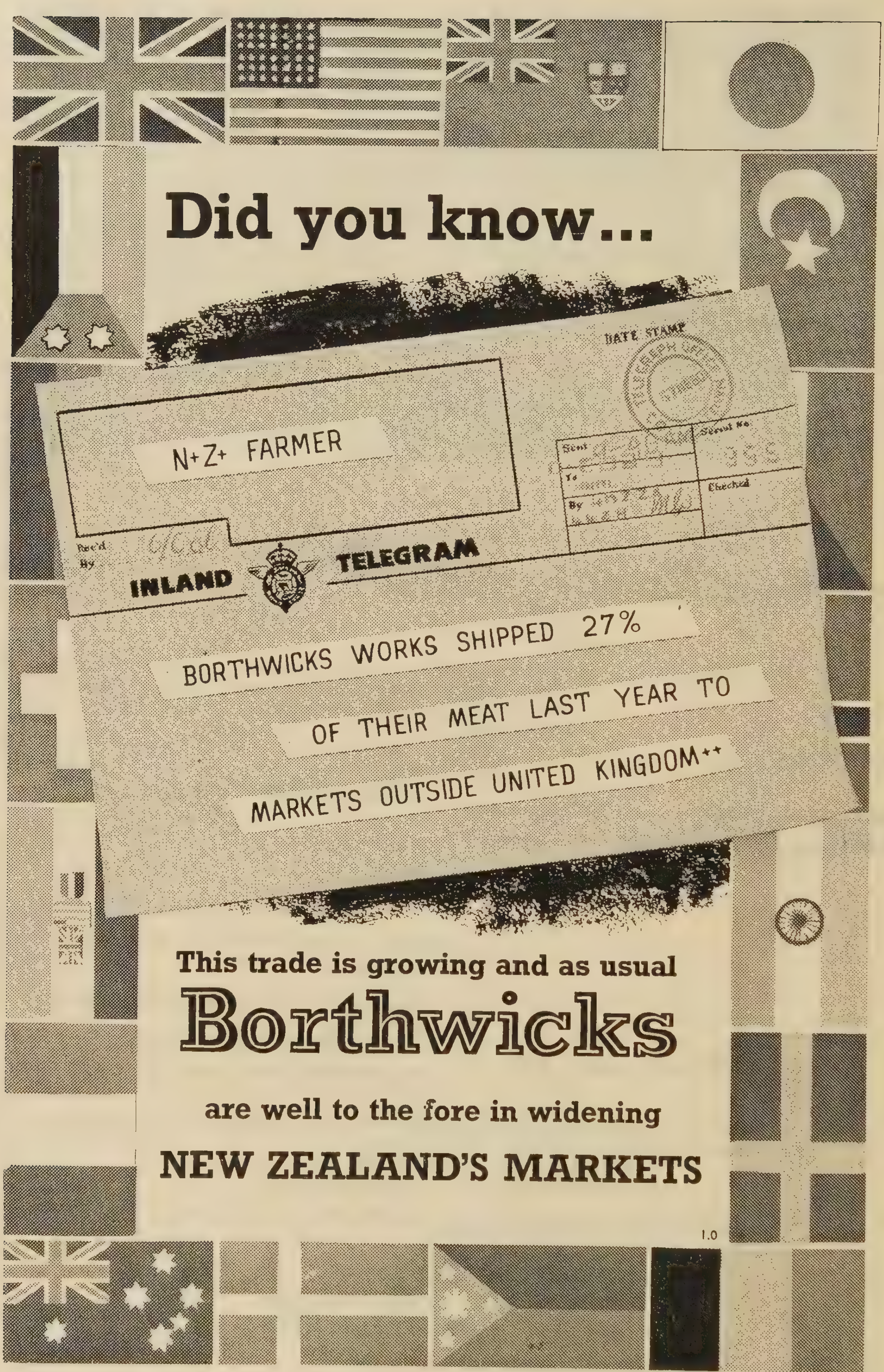

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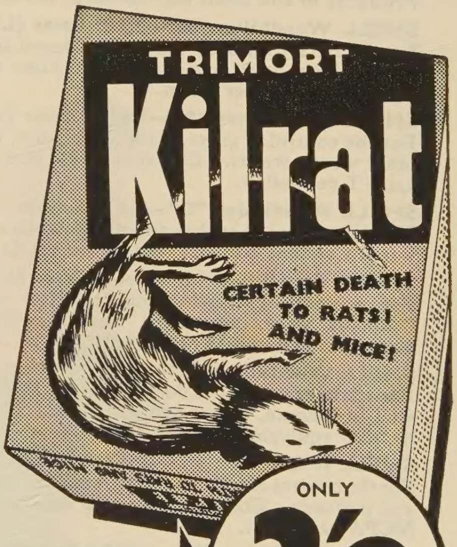
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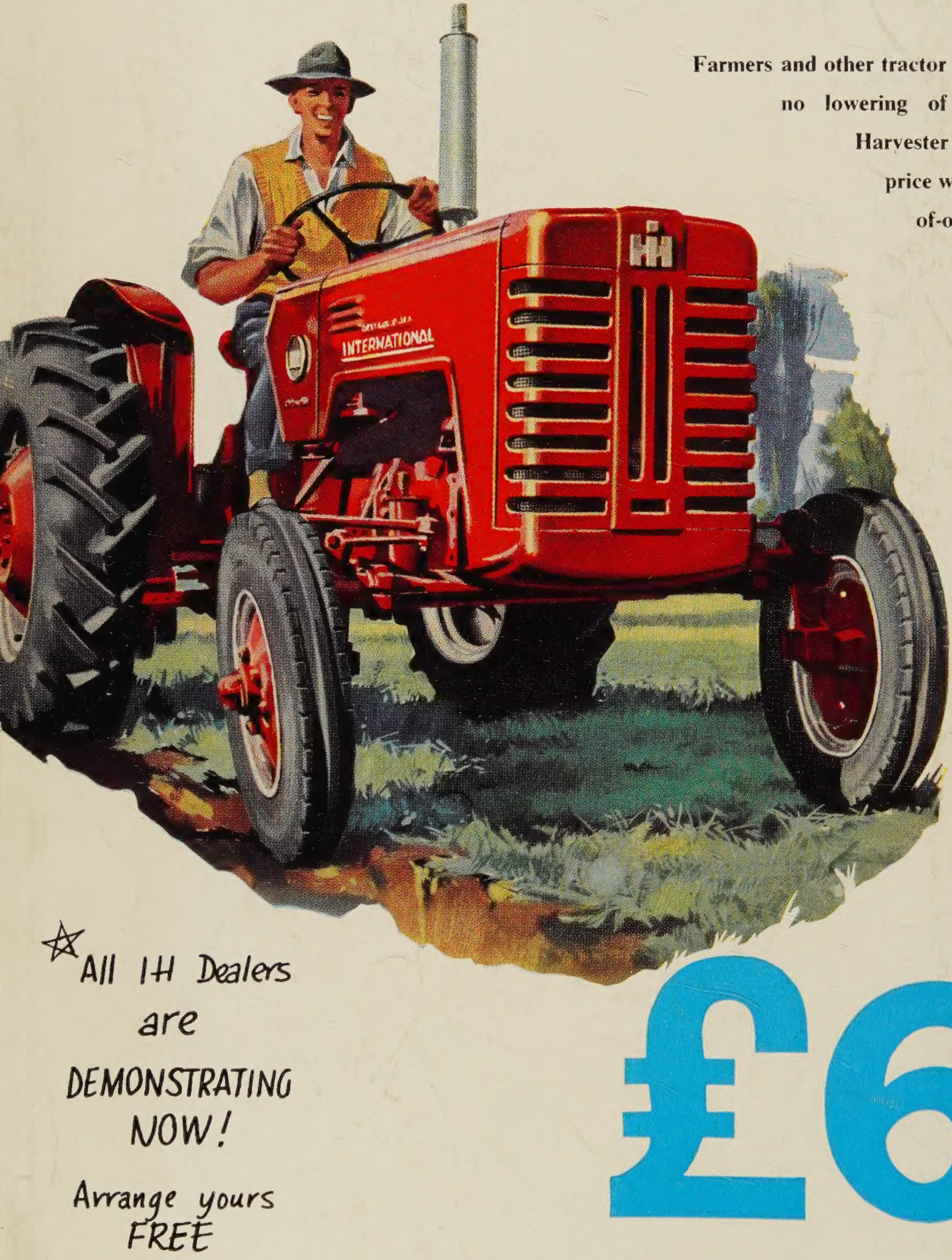

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